

TRANSPORTATION RESEARCH AND DEVELOPMENT: INVESTING IN THE FUTURE

HEARING

BEFORE THE

SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY,
AND STANDARDS

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

APRIL 10, 2003

Serial No. 108-10

Printed for the use of the Committee on Science



Available via the World Wide Web: <http://www.house.gov/science>

U.S. GOVERNMENT PRINTING OFFICE

86-341PS

WASHINGTON : 2003

For sale by the Superintendent of Documents, U.S. Government Printing Office
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**TRANSPORTATION RESEARCH AND
DEVELOPMENT: INVESTING IN THE FUTURE**

THURSDAY, APRIL 10, 2003

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND
STANDARDS,
COMMITTEE ON SCIENCE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Vernon J. Ehlers [Chairman of the Subcommittee] presiding.

**COMMITTEE ON SCIENCE
SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY & STANDARDS
U.S. HOUSE OF REPRESENTATIVES**

***Transportation Research and Development:
Investing in the Future***

Thursday, April 10, 2003

10:00 AM – 12:00 PM
2318 Rayburn House Office Building (WEBCAST)

Witness List

Mr. Emil Frankel
Assistant Secretary for Transportation Policy
U.S. Department of Transportation

Mr. Eric E. Harm, P.E.
Deputy Director, Division of Highways
Illinois Department of Transportation

Dr. Michael Walton
Ernest H. Cockrell Centennial Chair
University of Texas at Austin, Department of Civil Engineering

Ms. Kate Siggerud
Acting Director, Physical Infrastructure Team
General Accounting Office

Ms. Anne P. Canby
President
Surface Transportation Policy Project

Dr. Michael Meyer
Professor
Georgia Institute of Technology
School of Civil and Environmental Engineering

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HEARING CHARTER

SUBCOMMITTEE ON ENVIRONMENT, TECHNOLOGY, AND
STANDARDS

COMMITTEE ON SCIENCE

U.S. HOUSE OF REPRESENTATIVES

**Transportation Research and
Development: Investing in the Future**THURSDAY, APRIL 10, 2003
10:00 A.M.—12:00 P.M.

2318 RAYBURN HOUSE OFFICE BUILDING

Purpose

On Thursday, April 10, 2003 at 10:00 a.m., the Subcommittee on Environment, Technology, and Standards of the House Science Committee will hold a hearing on Research and Development (R&D) priorities for the reauthorization of the *Transportation Equity Act for the 21st Century* (TEA-21). TEA-21 funded a wide range of transportation R&D programs conducted by the Federal Government, states, universities and the private sector. The hearing will examine the state of the current R&D programs, how well they are meeting the goals laid out in TEA-21, and whether there are significant gaps in our R&D programs. In addition, the hearing will investigate how the Department of Transportation (DOT) can improve the quality of the R&D it funds, and measure the success of R&D projects, programs and the transportation system as a whole.

The Committee plans to explore the following overarching questions:

- What types of R&D are under-funded, over-funded, or not funded at all?
- Is our R&D spending properly balanced, for example between long- and short-term R&D and between “hard” R&D on materials like concrete and “soft” research on driving behavior? Are there major gaps in our transportation R&D, and if so, how should they be filled?
- Is there a way to organize transportation R&D through a coherent strategic plan despite its decentralized nature?
- Are there ways to improve transportation R&D, for example, by improving stakeholder involvement, strengthening peer review, or placing a greater emphasis on measuring the performance of R&D programs and the transportation system as a whole?

Witnesses

Mr. Emil Frankel, Assistant Secretary for Transportation Policy, U.S. Department of Transportation

Mr. Eric Harm, Deputy Director, Division of Highways, Illinois Department of Transportation

Dr. Michael Walton, Ernest H. Cockrell Centennial Chair University of Texas at Austin Department of Civil Engineering

Ms. Kate Siggerud, Acting Director, Physical Infrastructure Team, General Accounting Office

Ms. Anne Canby, President, Surface Transportation Policy Project

Dr. Michael Meyer, Professor, Georgia Institute of Technology School of Civil and Environmental Engineering

General Background

In 1998, Congress passed TEA-21, which funded State and Federal activities to support our nation’s transportation system. TEA-21 included a title on transportation R&D (Title V). The Science Committee shares jurisdiction with the Transportation and Infrastructure Committee over surface transportation R&D. As part of TEA-21, the Science Committee passed the Surface Transportation Research and

Development Act, H.R. 860 (105th Congress). Many of the provisions from H.R. 860 were incorporated into the House and final version of TEA-21 legislation.

Over the six-year life of TEA-21 (1998–2003), the Federal Government will have invested approximately \$2.9 billion (or about \$500 million per year) in surface transportation R&D under Title V. The funding for TEA-21 comes from gas tax receipts that are deposited in the Highway Trust Fund. Although this is a significant R&D investment, the federal transportation R&D investment represents only about 0.5 percent of federal spending on surface transportation. Many experts criticize this level of investment as too low. By comparison, the Federal Government invests approximately 10 percent of total health care spending on R&D. While Congress increased funding for overall transportation programs by about 40 percent in TEA-21, funding for transportation R&D remained relatively flat.

Transportation R&D is highly decentralized, with the Federal Government, states, universities, the National Academy of Sciences, and the private sector each playing an important role. In TEA-21, Congress further decentralized R&D by increasing the proportion of R&D funds that go directly to states, while decreasing the federal share of R&D dollars. At the federal level, the Federal Highway Administration (FHWA) conducts surface transportation research (primarily through the Turner Fairbanks laboratory in Virginia), supports technology development and deployment, and funds training and education programs. Other DOT agencies, such as the Federal Transit Administration (FTA), also conduct some research. The states are required to spend 25 percent of their State Planning and Research (SPR) funding (which is two percent of their overall funding) on research, and tend to fund applied research aimed at the implementation of tools and technologies. In addition, each of the states contribute 5.5 percent of its SPR funding to the National Cooperative Highway Research Program (NCHRP), a program administered by the Transportation Research Board (TRB), which is part of the National Academy of Sciences, and designed to address research issues relevant to all states. Universities also receive funding through the University Transportation Center (UTC) program, and have great discretion in the research they conduct. There is no strategic plan for how all of these actors should fit together to create a comprehensive and coordinated research program.

The R&D conducted under TEA-21 is wide ranging. Federal R&D includes research on materials (such as pavements and concrete), structures (such as bridges), operations (such as traffic light timing), asset management, planning and environment, Intelligent Transportation System (ITS) technologies (such electronic toll collection and adaptive cruise control), safety (such as rumble strips and research on driver behavior), and transit (such as Bus Rapid Transit).

Surface transportation R&D has produced many successes. Some examples in highway safety are improved designs of guardrails and median barriers and the development of rumble strips. New technologies have been successfully developed for retrofitting existing bridges and building new bridges to resist earthquake damage. Increases in the lifespan of pavements, realized through research on materials, have saved money and reduced the disruption caused by construction. Finally, in the operations field, Geographic Information Systems (GIS) have improved the management of vehicle fleets, including transit fleets, increasing their efficiency.

Note: Additional detail on the goals and organization of surface transportation R&D funded by the Federal Government, including descriptions and funding levels, is included in the appendix.

Issues

Is surface transportation R&D under-funded? The Federal Government invests only 0.5 percent of total federal spending on surface transportation in R&D. Many stakeholders believe that this level of investment is inadequate given that total national transportation spending is roughly 10 percent of the Nation's Gross Domestic Product (GDP). Stakeholders, including the American Association of State Highway and Transportation Officials (AASHTO) have called for a greater investment in transportation research.

Is our R&D spending balanced? According to the TRB and many others, our current R&D portfolio is not properly balanced between short-term applied and long-term fundamental R&D, between "hard" (materials, structures) and "soft" (human factors and policy) R&D, and between R&D on highways and on other modes, such as transit, bicycling and walking. Instead, the decentralized structure of R&D, the needs of some important stakeholders for quick-fix R&D products, and the shift of R&D funds to states under TEA-21 has led to a heavy emphasis on short-term, applied R&D into materials and structures (such as pavements and bridges).

Are there major gaps in our transportation R&D? The funding shortfall and imbalanced portfolio, coupled with a large number of earmarks, have contributed to important R&D gaps. The Transportation Research Board (TRB) and others have identified critical gaps, including environmental R&D, long-term fundamental research, policy research (addressing such things as changing demographic, economic and social trends), performance measurement and evaluation R&D, research addressing institutional barriers to deployment (particularly for ITS technologies), transit R&D, and security R&D.

How should these gaps be filled? Funding the Surface Transportation Environmental Cooperative Research Program (STECRP) and the Future-Strategic Highway Research Program (F-SHRP) could fill several (but not all) of these gaps. STECRP would carry out research on the links between environment and transportation. F-SHRP would address R&D gaps in four areas: (1) Renewal of the existing highway infrastructure, (2) Safety, (3) Reliability of travel times, and (4) Capacity, which will look holistically at the relationship between highways, the economy, communities and the environment. Other research programs or emphases will be required to fill the remaining gaps.

More background on these two programs and other research gaps is included later.

Does the decentralized nature of transportation R&D undercut strategic planning? Federal funding of transportation R&D is highly decentralized with funds flowing to federal agencies, states, universities, and the Transportation Research Board (TRB). Although this structure gives stakeholders an opportunity to shape transportation R&D, TRB, FHWA and others point out that this structure, coupled with Congressional earmarks, has undermined FHWA's ability to carry out a multi-year strategic R&D plan, which could help R&D target important gaps.

Is there relevant stakeholder involvement in DOT research? Both the TRB and the General Accounting Office (GAO) have recommended a greater role for stakeholders (such as researchers, research sponsors, users, and other affected parties) in determining the direction of DOT R&D programs. The critical challenges are ensuring that stakeholder input is balanced across appropriate interest groups and sought at the appropriate point in the research process.

Should the FHWA strengthen its competition and peer-review requirements? According to GAO, FHWA rarely subjects R&D project proposals to competition and peer-review, and frequently does not follow best practices in evaluating the outcomes of R&D projects or in fostering deployment of R&D results.

Is the Intelligent Transportation System (ITS) Research and Deployment program meeting users needs? The ITS program is designed to use emerging technologies in other fields (such as communications) to improve transportation system performance. While it is not clear whether DOT has a clear plan for developing technologies that users will deploy, it is clear that DOT does not evaluate technologies to see if they are measurably improving performance (by reducing congestion or improving safety). Even among proven technologies, institutional barriers to deployment (for example, fragmented authority, privacy considerations, and rigid procurement rules) hamper effective deployment of technologies and must be surmounted.

Should we modify the University Transportation Center Program? TEA-21 created 10 regional centers, which were selected by competition, and 33 other earmarked centers, which received direct funding to conduct R&D. Because there was little to no competition for most of the named centers, many believe the quality of the R&D is variable. The universities themselves primarily determine the direction of their R&D efforts, and are not part of any systematically developed strategic R&D agenda.

How can we improve data collection at the Bureau of Transportation Statistics (BTS)? According to a number of recent TRB reports and various user groups (such as local and regional planning organizations, as well as the freight and shipping community), BTS has not lived up to its mandate in TEA-21 to provide sound, comprehensive information on the condition and performance of our transportation system. As a result, we have inadequate data to guide private sector investment decisions (particularly for freight movement), local and regional transportation planning, and overall strategic planning and performance evaluation.

Do we know whether our transportation system is meeting the goals of TEA-21? Although the goals of TEA-21 are well accepted and the Federal Government spends more than \$30 billion per year on surface transportation, DOT carries

out little research and provides little information on whether the transportation system as a whole and our annual transportation investments meet the goals of TEA-21.

Background on Issues

Research and Development Gaps

The decentralized structure of transportation R&D and inadequate funding, have led to several critical gaps. In some areas, the Transportation Research Board (TRB) has recommended specific and detailed programs to fill gaps. However, in other areas it is not clear exactly how these gaps should be addressed programmatically.

Future Strategic Highway Research Program (F-SHRP)

Building on the success of Strategic Highway Research Program (SHRP) created in the precursor to TEA-21, the Intermodal Surface Transportation and Efficiency Act of 1991 TEA-21 called for TRB to develop a proposal for Future-SHRP to cut across disciplines and address short- to medium-term R&D gaps. In response, TRB developed a proposal in 2001 that would address R&D gaps in four areas: (1) Renewal, which will focus on R&D to minimize disruptions as we renovate existing highway infrastructure; (2) Safety, which will focus on the link between human factors and circumstances that lead to collisions at intersections; (3) Reliability, which will focus on R&D to improve the reliability of travel times by reducing the frequency and effects of events that cause delay; and (4) Capacity, which will look holistically at the relationship between highways, the economy, communities and the environment. TRB proposes funding F-SHRP with a takedown of .25 percent of federal-aid highway funds apportioned to the states, which would generate approximately a total of \$450 to \$500 million over six years. The proposal has strong support from key constituency groups such as TRB, the American Association of State Highway and Transportation Officials (AASHTO) and private associations.

Surface Transportation Environmental Cooperative Research Program (STECRP)

GAO, TRB and others have identified the lack of environmental R&D as a major gap in our transportation research portfolio. To fill this important gap, the Science Committee created the STECRP program, which was included in TEA-21. The program was to be modeled on the highway and transit cooperative research programs, and included provisions for an advisory committee to develop a long-term strategic plan. The goal of the program was to develop knowledge, tools, and performance measures that would help us understand the linkage between the environment (which includes energy) and the transportation system. Proponents believed STECRP would fill in missing pieces that could help TEA-21 meet its broad policy goals.

However, DOT has yet to allocated money to the program. The U.S. DOT contracted with the TRB to create the advisory committee, which released its strategic plan in 2002 as TRB Special Report 268. The strategic plan calls for six areas of concentrated R&D: (1) human health, (2) ecology and natural systems, (3) environmental and social justice, (4) emerging technologies, (5) land use, and (6) planning and performance measures. There has been general praise of the plan for its integrated approach to environmental and energy impacts of the Nation's transportation systems. The report stated that it would be reasonable to fund federal surface transportation-environment R&D at up to \$150 million per year. According to the FHWA Administration, it spends about \$10 million a year on environmental research, but this funding cuts across various programs and business units, with no specific focus or goal. AASHTO supports the program and has recommended a funding level of \$15 million per year.

Advanced Research

TRB Special Report 261, "The Federal Role in Highway Research and Technology" concludes that most transportation R&D is focused on near-term, applied issues, as the transportation community tends to be risk averse. There is a need for fundamental, long-term (6-20 years) research aimed at achieving breakthroughs in understanding transportation phenomena. Examples of this type of research include research on pavements at the molecular level, which could lead to pavements that would last twice as long, and research into understanding how to assess the value of our surface transportation assets. The report stated that, of all the actors in the transportation system, only the Federal Government is in a position to conduct what they characterize as "high-risk" research. The report further acknowledged that FHWA's current research program does not reflect this role. While TEA-21 includes an advanced research program, it is funded at less than \$1 million and has no spe-

cific focus. TRB proposed that FHWA should spend 25 percent of its surface transportation R&D on this type of advanced research.

Policy R&D

Increasingly, transportation planners, social scientists and engineers are stating that to better manage our transportation system problems we shift some of our attention to policy research questions. Specifically, they point to dramatic changes in demographic, economic and social trends that will affect and are affected by the transportation system. For example, the aging of the baby boomers has profound research and transportation system implications. Today, roughly 13 percent of the population is over 65. By 2020, that figure will be more than 20 percent. This means that for the first time in our history, there will be large numbers of senior citizens living in suburban communities whose lifestyles depend on easy mobility. However, we have not invested in the research needed to know how to adapt our communities and our transportation system to meet this inevitable trend.

Economic trends raise other questions. Household transportation costs are now second only to housing expenses for most families in America, a dramatic change from 30 years ago. For many families, these costs may be delaying home purchases, and savings for college and retirement. Again, we have little research on this phenomenon, its implications, or possible policy responses.

The potential link between transportation and health is another research gap. For example, there is a growing body of evidence that links the obesity epidemic in America to our auto dependency and related lack of exercise. Although the Centers for Disease Control has been involved in some research, the gap in research is perceived to be so large that the Robert Wood Johnson Foundation has initiated a major initiative to better understand this phenomenon. We must examine other ways to ensure that this research becomes part of an overall transportation research effort.

ITS Evaluation and Deployment R&D

The ITS program promises to provide valuable tools and technologies to improve system performance (by reducing congestion and improving safety and security), however some say that there are research gaps that limit the effectiveness of ITS technologies and the cost-effectiveness of our sizable investment in them. The ITS Joint Program Office (housed in FHWA) recently ended its contract with ITS America to act as an advisory committee and is in the process of chartering a new advisory committee. This provides Congress with the opportunity to address significant gaps in the ITS program through shaping the advisory committee and implementing other programmatic changes.

Some stakeholders have said that it is not clear that the DOT develops a clear strategic plan, with relevant stakeholder involvement, before investing R&D dollars in ITS technologies. In addition, many stakeholders point out that ITS technologies are not adequately evaluated. For example, while DOT knows how many lanes are equipped with electronic toll collection technology, and how many dynamic signboards have been deployed on roadways, it does not know if, and how much, these technologies have contributed to mitigating congestion. Without this evaluative data, it is difficult to know which technologies to deploy.

Even among promising technologies, there are significant barriers to deployment: (1) fragmented authority at the local level over deploying and operating technologies, (2) privacy considerations in the collection and dissemination of information, (3) the need for public-private partnerships in deploying in-vehicle ITS technologies such as adaptive cruise control and transponders to transmit and receive information, (4) procurement rules that limit states and localities from looking at costs and benefits holistically, and (5) the difficulty of attracting and retaining a capable workforce to operate technologies. R&D into these issues, such as how to collect and disseminate information in a way that protects privacy, is critical to the success of ITS technologies. In addition, the ITS deployment section of TEA-21 has been 100 percent earmarked and so ITS technologies are not deployed in a strategic manner to achieve optimum results.

Transit R&D

Federal Transit Administration (FTA) R&D funding has remained stagnant for more than 10 years at approximately \$60 million per year. The Transit Cooperative Research Program (TCRP), administered by the TRB to address short-term needs of national importance, has also received flat funding at \$8.25 million per year since 1992. This low level of funding has led to under-investment in several areas. This includes research and assistance to provide tools and information to transit agencies to increase ridership, R&D on reducing the life-cycle costs of transit vehicles, systems and facilities, research on multi-modal transportation planning, and public-pri-

vate research on technologies to develop hybrid-electric vehicles. AASHTO has recommended that FTA funding increase by at least \$70 million annually, and that TCRP be funded at \$15 million annually.

Security R&D

Since 9/11, the Nation has focused heavily on national security. Our transportation system plays an important role in national security, both as a system to move people away from threats as well as a system that is vulnerable. It is clear that research must focus on critical security issues. Again, ITS provides promising solutions to national security problems. ITS information technologies, such as dynamic signboards, can direct vehicles in an evacuation in order to efficiently move people away from threats.

ITS technologies could track freight movement and detect variation from an expected pathway. While there are no ready answers to the scope of research that is required to protect national security, DOT must direct greater resources, in cooperation and coordination with the Department of Homeland Security, toward transportation security research.

Performance

In order to develop an R&D program that strategically invests in the transportation system, it is necessary to understand the performance of our R&D projects, programs, and the transportation system as a whole. Although interest in performance evaluation continues to grow across the Federal Government, transportation R&D programs and the Nation's overall transportation system have not yet been subject to meaningful performance evaluation.

There are at least three levels at which Congress should be concerned with building performance into transportation programs: 1) Project level—DOT R&D does not follow “best practices” in using peer review for project evaluations, or evaluating deployment of their R&D results; 2) Portfolio level—little R&D is done to assess whether we have balanced the R&D program across the goals of TEA-21; and 3) System level—DOT carries out little or no policy R&D looking at whether the overall transportation system is delivering on the goals of TEA-21.

In a recent report on DOT's R&D projects, GAO concluded that FHWA does not follow best R&D practices for competing and conducting merit review of project proposals or for evaluating project outcomes. GAO is concerned that without competitive, merit review, a practice carried out by many other federal R&D programs, it is difficult to know whether funds are being directed to the highest quality research. And project evaluation is necessary because without meaningful performance goals or regular evaluations, we cannot know what research should be continued, what methods, tools and technologies should be deployed, or how to best invest federal R&D dollars. The ITS program, described above, illustrates this point.

Bureau of Transportation Statistics (BTS)

In order to do performance and evaluation R&D, researchers need high quality data. The Bureau of Transportation Statistics (BTS), created in ISTEA, was intended to collect and analyze single and multi-modal transportation data to enable sound transportation policy decisions. Under TEA-21, BTS has received \$31 million per year from the Highway Trust Fund. However, BTS has not lived up to its billing as an independent source of high quality information.

According to a number of recent TRB reports and various user groups (such as local and regional planning organizations, as well as the freight and shipping community), BTS faces a number of important challenges if it is to meet its mandate. At the organizational level, BTS has been hamstrung because it does not control many of the most important data sets maintained by department. It is forced to rely on the other entities, which have been collecting data in certain ways for years. Because it has not been responsive enough to user needs, it may be necessary adjust the existing advisory system structure required in TEA-21.

Data quality and collection has suffered because of inadequate and flat funding. Sample sizes of studies have been cut repeatedly, making the data less useful, especially at more local and regional levels. The increasing use of phone surveys and voluntary surveys is reducing response rates and missing significant constituencies (such as those who are Spanish speaking, without phones or who only use cell phones). The primary surveys, which look at trip making for households and freight, are not addressing the entire range of trips to move people and goods from one place to another.

TEA-21 also authorized the creation of a National Transportation Library, akin to the National Library of Medicine for the transportation field. After funding it for several years, DOT is proposing to cut the program in FY 04 budget. The Committee will need to look carefully at the reasons for eliminating the program.

Questions for Witnesses

Mr. Emil Frankel, Assistant Secretary for Transportation Policy, U.S. Department of Transportation

- Please give an overview of the surface transportation research programs administered or funded by the Department of Transportation (DOT) with particular emphasis on the following questions: How much money does DOT spend on this research? Please give a list of examples of the type of research conducted. Who actually conducts the research (Federal Government, states, universities, private sector)? How is surface transportation research in the various modes coordinated within the DOT?
- What steps has DOT taken to create a strategic plan for surface transportation research and development, including performance indicators and Government Performance and Results Act (GPRA) goals, as required by TEA-21? By what measures does DOT determine whether this research it funds meets the overall goals of TEA-21?
- What surface transportation research, if any, does DOT fund that could be considered fundamental, long-term research aimed at achieving breakthroughs in understanding transportation? Why is such research important?
- How do you involve stakeholders in determining what surface transportation research to conduct? In what ways could you increase stakeholder involvement these research projects before contracts are finalized?

Mr. Eric Harm, Deputy Director, Illinois Department of Transportation

- Please describe the State of Illinois' transportation research programs with particular emphasis on the following questions: How much money does the state spend on such research? What types of research does it conduct? Who actually conducts the research (e.g., in-house labs, universities, or private sector labs)? What role, if any, do the universities play in conducting research for the state?
- What should be the role of the Federal Government in conducting transportation research? What should be the role of the universities?
- What role, if any, do states like Illinois play in setting priorities for the Federal Highway Administration (FHWA) research program? How much of the research conducted by FHWA produces results that are implemented in your state? More specifically, has the ITS program produced technologies or research that you have used? Please provide other examples of FHWA research that you have implemented.
- What are the important gaps in our current transportation research agenda? Should the government invest more in transportation research? If so, what types of research are under-funded, what types of research are over-funded, and what types of research are we not funding at all? What need is there for long-term, fundamental transportation research?

Dr. Michael Walton, Ernest H. Cockrell Centennial Chair, University of Texas at Austin Department of Civil Engineering

- What are the goals the Future Strategic Highway Research Program (F-SHRP) is expected to achieve? Why is this research important, and what funding level do you recommend for this program?
- Please define advanced research and give specific examples of advanced research currently being conducted. Should we be doing more advanced research and, if so, who should conduct it?
- Is there a need for improved stakeholder involvement in Department of Transportation (DOT) research? If so, in what ways could DOT better involve stakeholders in planning its research agenda and in planning for specific projects?
- Many people have criticized the ITS program for failures in technology transfer, and this is often due to institutional barriers, such as driver acceptance or liability concerns. How should research address these barriers? In addition, is there a better way to evaluate the performance of ITS technologies to determine how they help meet goals such as safety and congestion mitigation?
- Are we getting our money's worth from our transportation research investments? How can we measure whether our research program is meeting our overall transportation goals such as mobility, safety, economic vitality, system preservation and environmental protection?

Ms. Kate Siggerud, Acting Director, Physical Infrastructure Team, General Accounting Office

- How does the Federal Highway Administration (FHWA) currently involve stakeholders in determining the direction of its research programs? What is the best way to ensure that transportation R&D programs incorporate the present and future needs of the users (states, Metropolitan Planning Organizations and the private sector)?
- How can FHWA ensure that projects funded with federal dollars are of the highest quality? Are there lessons that can be learned from other Federal Government agencies?
- How does FHWA currently evaluate ongoing and completed research, and what are the strengths and weaknesses of its approach? How can FHWA improve its evaluation process to ensure that research projects achieve their intended results?

Ms. Anne Canby, President, Surface Transportation Policy Project

- Do you support the Surface Transportation Environment Cooperative Research Program (STECRP) and the Future-Strategic Highway Research Program (F-SHRP)? How would these programs fill important gaps in our research agenda? At what level should these programs be funded?
- Does the current overall transportation research portfolio invest the appropriate amount in research that supports each of TEA-21's goals, including mobility, safety, economic vitality, system preservation and environmental protection? What steps, if any, should Congress take in those areas where the research is inadequate?
- Are we currently conducting research on critical transportation policy questions such as how demographic, economic and social trends will affect future system needs? What questions are we not yet investigating, and do we have the necessary data to help us answer these questions? What would be the appropriate entity to conduct this type of policy research—for example, the Federal Government, the Transportation Research Board (TRB), universities?
- Are we currently measuring the performance of our transportation investments relative to the goals set forth in TEA-21 (including goals for mobility, safety, economic vitality, system preservation and environmental protection)? If not, what are the barriers to doing so? What research, if any, is needed to overcome these barriers?
- Why does STPP believe that the Bureau of Transportation Statistics (BTS) has not lived up to its mandate as outlined in ISTEA and TEA-21? What additional kinds of data, if any, do we need to measure the performance of the transportation system? What recommendations do you have to improve the quality and relevance of data collection and analysis by BTS?

Dr. Michael Meyer, Professor, Georgia Institute of Technology School of Civil and Environmental Engineering

- What are the major economic, demographic, and social trends that affect the performance of our transportation system and the demands it is expected to meet? How can research efforts to understand these trends best be directed to improving our nation's transportation?
- Are we currently conducting research on such critical transportation policy questions? What questions are we not yet investigating, and do we have the necessary data to help us answer these questions? What would be the appropriate entity to conduct this type of policy research—for example, the Federal Government, TRB, universities?
- Are we currently measuring the performance of our transportation investments relative to the goals set forth in TEA-21 (including goals for mobility, safety, economic vitality, system preservation and environmental protection)? If not, what are the barriers to doing so? What research, if any, is needed to overcome these barriers? To what extent is the Bureau of Transportation Statistics (BTS) suited to provide the necessary information to measure the performance of these investments?

Appendix 1

Goals and Descriptions of Federally Funded Surface Transportation R&D Programs

Goals of TEA-21

The goals of TEA-21 are to: (a) support economic vitality, especially by enabling global competitiveness, productivity, and efficiency; (b) increase the safety and security of the transportation system for motorized and non-motorized users; (c) increase the accessibility and mobility options available to people and for freight; (d) protect and enhance the environment, promote energy conservation, and improve quality of life; (e) enhance the integration and connectivity of the transportation system, across and between modes, for people and freight; (f) promote efficient system management and operation; and (g) emphasize the preservation of the existing transportation system.

Programs funded out of Title V of TEA-21

Federal Highway Administration (\$529 million¹)

The Federal Highway Administration's (FHWA) mission is to enhance mobility, while ensuring safety and security, and promoting efficiency and protection of the environment. The FHWA R&D budget, authorized in Title V of TEA-21, is divided into four major components: 1) surface transportation research; 2) technology deployment; 3) training and education; and 4) intelligent transportation systems.

Surface transportation research (\$101 million) The funding for this program is directed primarily toward pavements and structures research, including the Long-Term Pavement Program. Other R&D programs include safety; environment, planning and right-of-way; highway operations and asset management; technical assessment, support and deployment; and advanced research.

Technology Deployment (\$41 million) Deployment was a major focus of TEA-21 because there was concern that new technologies were being developed through the R&D program but not deployed. Funding is distributed to FHWA headquarters and field offices to support technology and innovation deployment activities.

Training and Education (\$17 million) This program includes: 1) the National Highway Institute, which develops and administers transportation-related training and education programs; 2) the Local Technical Assistance Program which aims to improve the skills and knowledge of local transportation providers through 58 LTAP centers; and 3) the Eisenhower Transportation Fellowship Program, which awards fellowships to undergraduate and graduate students.

Intelligent Transportation Systems (\$95 million for research; \$108 million for deployment) ITS is founded on the premise that by applying well-established technologies in communications, control, electronics and computer hardware and software, surface transportation system performance can be improved. The goals of the program are to reduce congestion, enhance safety, mitigate environmental impacts, enhance energy performance, and improve productivity. In TEA-21, the ITS program was funded in two parts—research and deployment. The research program includes research on intelligent vehicles, electronic toll collection and smart cards, as well as funding for standard setting and the development of a national architecture. In TEA-21, virtually none of the research dollars were earmarked, but 100 percent of the deployment dollars were earmarked. The ITS program is administered by the Joint Program Office, housed in FHWA, but funding also flows to other DOT administrations for ITS research (such as National Highway Traffic Safety Administration).

State Planning and Research (\$128 million)

States fund an assortment of R&D programs using their own revenue sources as well as federal funds. Research funded by states tends to be applied and is often geared toward figuring out how to implement tools and technologies at the local level. States must set aside two percent of the money they receive from several federal surface transportation programs for state planning and research (SPR) activities. Of this amount, 25 percent must be spent on R&D activities. On a voluntary basis, the states contribute 5.5 percent of their SPR funds to the National Coopera-

¹ Funding levels are from FY02 and were taken from the U.S. Department of Transportation's "Research, Development and Technology Plan," September 2002

tive Highway Research Program (NCHRP) to conduct R&D on issues of national importance (more information on this program is included below). States in certain regions also often pool R&D funds to conduct research on regional issues.

National Cooperative Highway Research Program (\$31.5 million)

The NCHRP facilitates R&D in acute problem areas that affect highway planning, design, construction, operation and maintenance. NCHRP is administered by the National Academy of Sciences Transportation Research Board (TRB). Research programs are identified through a two-stage process that involves the American Association for State Highway and Transportation Officials' (AASHTO) Standing Committee on Research (SCOR). Problems are solicited from the SCOR and nominated projects are ranked, prioritized, and voted on annually. The TRB then puts together a panel of experts who select and oversee the work of the research contractors for each contract.

University Transportation Centers (\$30 million)

The University Transportation Center (UTC) program was created in 1987 under the precursor to ISTEA. The UTC program distributes funding to universities to conduct research and support graduate students in transportation fields. The program began with a competition for 10 regional centers around the country, funded at \$1 million per year (which is the same funding level these universities receive today). ISTEA and TEA-21 continued the competition for the 10 regional centers, but specifically listed other universities as centers, with little or no competition for the funding. FHWA and Federal Transit Administration (FTA) fund the program. Matching funds are also often provided by the states. While the Research and Special Projects Administration (RSPA) administers the funding, the universities themselves primarily determine how to spend their funds.

Bureau of Transportation Statistics (\$31 million)

The Bureau of Transportation Statistics (BTS), begun in 1992, is responsible for providing transportation data and information of high quality, and to advance the use of this data in public and private decision-making. The BTS compiles, analyzes and makes information accessible on the Nation's transportation systems; collects information on inter-modal transportation and other areas as needed; and works to enhance the quality and effectiveness of government statistics.

Program funded out of other Titles of TEA-21 and other statutes

Office of the Secretary (\$11.5 million)

The Office of the Secretary (OST) is responsible for formulating national transportation policy. OST focuses research on crosscutting or multimodal issues including safety, the environment (including climate change), energy, planning, and congestion management.

National Highway Traffic Safety Administration (\$82 million)

Established in 1970, the National Highway Traffic Safety Administration's (NHTSA) mission is to save lives, prevent injuries, and reduce traffic-related health care and economic costs. NHTSA's research includes databases and data collection, crashworthiness research to improve vehicle structure and design, biomechanics research to evaluate the extent and severity of potential crash injuries, and ITS research on collision avoidance systems such as adaptive cruise control (Intelligent Vehicle Initiative).

Federal Transit Administration (\$60 million)

The Federal Transit Administration's (FTA) mission is to ensure personal mobility and community vitality by supporting high-quality public transportation. FTA R&T encompasses several program areas, including safety and security, equipment and infrastructure, fleet operations, specialized customer services, planning and project development, and performance and review. The FTA also funds (at \$8 million) the Transit Cooperative Research Center (TCRP), administered by the TRB. The TCRP focuses on issues significant to the transit industry, with emphasis on local problem-solving research. FTA also funds university research through the UTC program.

Research and Special Programs Administration (\$10 million)

The Research and Special Programs Administration (RSPA) is the Department's multimodal research administration. RSPA has the task of coordinating research across the modes. In addition, RSPA conducts research in pipeline safety, hazardous materials, and emergency transportation.

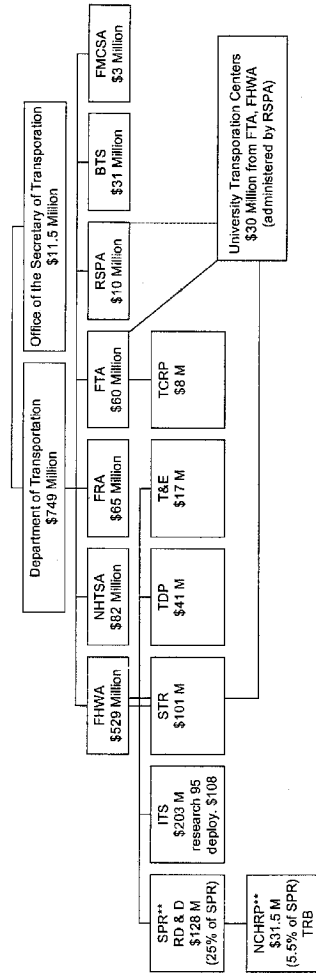
Federal Motor Carrier Safety Administration (\$3 million)

The Federal Motor Carrier Safety Administration's (FMCSA) focus is on saving lives and reducing injuries by helping to prevent truck and motorcoach crashes. FMCSA's R&T program includes research on major crash factors, training, education and outreach.

Federal Rail Administration (\$65 million)

The Federal Railroad Administration (FRA) promulgates and enforces railroad safety regulations, administers financial assistance programs to the railroads, and fosters the development of high-speed rail. The FRA R&D program addresses safety (including human factors, track and structures, hazardous materials, etc.). The FRA also manages the Next Generation High-Speed Rail program, and a Magnetic Levitation program. Only a small portion of FRA research funding comes from TEA-21.

Federal Surface Transportation Research Funding (FY 02)*



FHWA	Federal Highway Administration	ITS	Intelligent Transportation Systems
NHTSA	National Highway Traffic Safety Administration	SPR	State Planning and Research
FRA	Federal Railroad Administration	STR	Surface Transportation Research
FTA	Federal Transit Administration	TDP	Technology Deployment Program
RSPA	Research and Special Programs Administration	T&E	Training and Education
BTS	Bureau of Transportation Statistics	TCRP	Transit Cooperative Research Program
FMCSA	Federal Motor Carrier Safety Administration	NCHRP	National Cooperative Highway Research Program

*Data From: U.S. Department of Transportation's "Research, Development and Technology Plan" September 2002

** Indicates that these programs are funded through money allocated to the states

Chairman EHLERS. I now call the Subcommittee on Environment, Technology and Standards to order. I wish to welcome everyone here. We do not have one witness yet, but she is en route, and so since my good Ranking Member showed up on time, we will start on time. And we will welcome the new witness when she arrives.

It is my pleasure to welcome you to today's hearing, "Transportation Research and Development: Investing for the Future."

The United States has one of the most extensive transportation systems in the world. Every day planes, trains, boats, trucks, and automobiles transport billions of dollars worth of goods across America. Every day hundreds of billions of people use this system to travel to and from work, to visit family, or to go on a vacation. Moving people and goods from one location to another is one of the most basic means for an economy to grow.

However, this system faces tremendous challenges. The public wants safer, less congested roads. State and local governments are striving to meet this want, but much of their resources are tied up maintaining our existing system with little, if any, money left for improving it and planning for the future. Considering that we won't have the ability to simply build more roads to keep pace with our growth due especially to urban population density, we must look at new ways to improve the overall system to make it safer and more efficient.

As Will Rogers once said, "A Congressman is never any better than his roads, and sometimes worse." So those of us up here on the dais have—also have a keen interest in what is at stake as we examine our transportation system.

Today, we will review one aspect that can fundamentally improve the entire system in many different ways: surface transportation research and development. During consideration of the Transportation Equity Act for the 21st Century, commonly referred to as TEA-21, in 1998, and its precursor, the Intermodal Surface Transportation and Efficiency Act, known as ISTEA, in 1991, the Science Committee played a major role in creating the research and development provisions.

As we proceed to reauthorize TEA-21, the Science Committee will, again, play a key role in evaluating the current research programs and funding levels, understanding the gaps in our research agenda and proposing changes to improve it. In short, we want to make sure that we are getting our money's worth both from the research we do and from our transportation system as a whole.

Our task is not easy. Surface transportation research is complex and highly decentralized. The Federal Government plays a large role, as do states, which conduct their own research, universities, the National Academy of Sciences, which manages a nationwide research program, and the private sector.

TEA-21 has provided about \$600 million a year for highway research during the past five years. Although this is a significant investment, it represents only about $\frac{1}{2}$ of one percent spending by all units of government on highways. This is an extremely low percentage compared to industries and is a specific concern of mine. Given the tremendous challenges and pressures facing our transportation system, research is more important than ever, and proper funding is crucial to our success in meeting these challenges. And

I feel very strongly about that, not only because I am a research physicist, but simply by looking at corporations, entities who are involved in any activity, they generally spend far more than $\frac{1}{2}$ of one percent of their gross on research. And if they don't, they generally don't survive. I think we have to apply that same principle to the transportation industry, which will survive without it, but may not operate as efficiently as it could without additional research funding.

Our goal is to produce the research title to be included in reauthorization of TEA-21. Throughout this process, the Science Committee will continue to work with Members and staff from the Transportation and Infrastructure Committee. Also, as a senior Member of the Transportation Committee along with Chairman Boehlert, we will be intimately involved in all aspects of reauthorizing TEA-21 and to the new bill, which is tentatively named TEAM LOU.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF CHAIRMAN VERNON J. EHLERS

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a senior Member of the Transportation Committee along with Chairman Boehlert, we will be intimately involved in all aspects of reauthorizing TEA-21.

I welcome the distinguished panel before us, and I look forward to your testimony.

Chairman EHLERS. The Chair now recognizes Congressman Mark Udall, the Ranking Minority Member on the Environment, Technology and Standards Subcommittee for an opening statement. Mr. Udall.

Mr. UDALL. Thank you, Mr. Chairman. I, too, want to welcome the panel and Congressman Ehlers, I think that is the most positive thing Will Rogers ever said about a Member or Members of Congress. So we will add that to our repertoire.

I, too, am excited to hear what you all have to say today. And this hearing touches on a very important issue. It is one that I hear about frequently in my district. Our roads and highways in Colorado's case, our mass transit system is well—every weekend I am back in the district, people want to talk about congestion, about funding, and about what we can do to ease the problem. We have a lot of wide open space in Colorado, but the more and more we understand, you can't just build your way out of traffic problems. We have to use our current system more efficiently, improve our transportation planning, and develop highway materials that last longer and demand less maintenance. And as Chairman Ehlers pointed out, research is the only way, I believe, that we are going to develop the solutions for these transportation problems.

Starting in '91 with the passage of ISTEA, we began to devote a significant amount of transportation monies to research. We have had some successes, but we have also had some misses. And from what I understand, many of the misses are a function of not having a holistic approach to the transportation system and not giving sufficient consideration to human factors. And in that light, I believe that the public should have a greater role in transportation planning in the development of new technologies that might allow us to use our highway systems more efficiently. And I am concerned that human factor issues are not given an adequate consideration or not integrated sufficiently into our transportation R&D efforts.

Now we have got a tough budgetary environment right now, so we have to use our limited R&D funds efficiently and get the biggest bang for our buck. And that may mean we have got to be more rifle-shot oriented as opposed to a scatter shot approach that fund a host of well-meaning and possibly exciting R&D activities, but in that situation, we may not get the results that we want. We need to prioritize our research and development activities within the context of the overall transportation system so that it will perform its intended function, which is to efficiently and safely ensure the mobility of goods, services, and individuals within our communities and throughout the Nation.

And in that spirit, I hope you all have some specific suggestions as to how we can improve our R&D funding allocations to address some of these issues. I also want to encourage our witnesses—our witness from the Administration to discuss what should be the research agenda and priorities for the follow on to TEA-21. And I realize the Administration has not yet submitted a reauthorization bill to Congress, but we need your expert opinion on what the re-

search agenda and priority should be. So again, I want to thank you, and I look forward to the testimony this morning.

Chairman EHLERS. If there is no objection, all additional opening statements submitted by the Subcommittee Members will be entered into the record. Without objection, so ordered.

At this time, I would like to introduce our witnesses. We have—are pleased to have an outstanding panel with a great divergence of experience and views. And I am sure they will be extremely helpful to the Subcommittee as we begin developing our legislation. We are joined by, first of all, from the Department of Transportation, Mr. Emil Frankel. He is the Assistant Secretary for Transportation Policy in the U.S. DOT. Previously, he served as Commissioner of the Connecticut Department of Transportation and was Chairman of the Standing Committee on the Environment at the American Association of State Highway and Transportation Officials, familiarly known as AASHTO.

Mr. Eric Harm is the Deputy Director of the Division of Highways at the Illinois Department of Transportation. He is responsible for coordination of construction and research activities.

Dr. Michael Walton, not of TV fame, is the Ernest H. Cockrell Centennial Chair of the Department of Civil Engineering at the University of Texas at Austin. Dr. Walton is the Chairman of the Research and Technology Coordinating Committee at the Transportation Research Board and has also chaired numerous TRB panels, including the recent panels on strategic highway research and the federal role in highway research.

Next, we have Ms. Kate Siggerud, who is an Acting Director of the Physical Infrastructure Team for the U.S. General Accounting Office, familiarly known around here as the GAO. It is also known by a few other names occasionally, particularly by administration officials. For the past several years, she has directed GAO's review of surface transportation issues.

Next, we have Ms. Anne Canby, the President of the Surface Transportation Policy Project. Until recently, Ms. Canby was Secretary of the Delaware Department of Transportation. Previously, she has served as Deputy Assistant Secretary at the U.S. Department of Transportation and as Commissioner of the New Jersey Department of Transportation.

And last, but certainly not least, Dr. Michael D. Meyer is a professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology. He conducts research on economic, demographic, and social trends that affect the Nation's transportation system. Previously, he was Director of Transportation, Planning and Development for the State of Massachusetts.

As our witnesses know, spoken testimony is limited to five minutes each, and so we encourage you to condense your written testimony to five minutes oral testimony after which the Members of the Committee will also each have five minutes to ask questions. We will start with Mr. Frankel. Would you turn on your microphone, please?

STATEMENT OF MR. EMIL H. FRANKEL, ASSISTANT SECRETARY FOR TRANSPORTATION POLICY, U.S. DEPARTMENT OF TRANSPORTATION

Mr. FRANKEL. Mr. Chairman, Members of the Subcommittee, thank you for the opportunity to testify today on the important contributions of the U.S. Department of Transportation as you consider the role of research, technology, and education in surface transportation reauthorization legislation.

I have submitted a longer, more detailed written statement and ask that that be made part of the record of this hearing. And I might also say that I am looking forward to not only talking, but particularly listening to the questions and comments of Members of this subcommittee and my colleagues on this panel, many of whom are personal friends, I might say, but also known to me by reputation. And I am sure I will learn as much—learn probably more than I will contribute to this hearing.

As you know, Secretary Mineta has called for a safer, simpler, smarter transportation system, and the development of new technologies is critical to achieving such a system. The successful development and implementation of appropriate technologies is key to alleviating many of the problems facing transportation. The Department of Transportation will partner with other government agencies, the private sector, and academia to enhance the process of transportation innovation and facilitate the speedy adoption of new technologies and new approaches.

DOT supports research in all areas of transportation in order to first improve the operational mission of the Department and our public sector partners, in particular, state and local governments and transit agencies who are DOT grant recipients; second, support our regulatory activities and policy agenda; and third, assume some of the risks of innovation and galvanize our stakeholders to adopt those innovations that appear to be successful, appropriate, and productive. Most of our research agenda is relatively near-term as we seek immediate solutions to the serious problems we face in safety, congestion, and the environment. Nonetheless, it is important that we use some of today's scarce resources to search for long-term solutions.

The Department has made considerable progress under ISTEA and TEA-21 in many areas, including Intelligent Transportation Systems, or ITS, pavement improvement, and safety related behavioral research, to name just a few. We will build upon the success of these programs and extend the concept of "smart transportation" to the entire surface transportation sector.

The Administration's surface transportation reauthorization proposal is still being refined in the Executive Branch Review process. It is in the last stages, I hope, of the clearance process. And we look forward to presenting our specific reauthorization proposal to you very soon.

In the meantime, President Bush's fiscal year 2004 budget provides the foundation for our reauthorization proposal and signals the importance placed on research, technology and education programs by the President and by Secretary Mineta. Total research, development, and technology funds for DOT's surface transportation modes totaled approximately $\frac{3}{4}$ of a billion dollars annually.

This budget represents a strong commitment to excellent and adequately funded research and technology programs.

I would like to briefly summarize some of the highlights of what the Department has proposed for fiscal year 2004. The Federal Highway Administration fiscal year 2004 budget requests a substantial increase in funding for research. The Surface Transportation Research Development and Deployment Program asked for just under \$200 million compared to the \$153 million appropriated by Congress in fiscal year 2003 and \$121 million for the ITS program research compared to \$110 million in fiscal year 2003.

The National Highway Traffic Safety Administration, NHTSA's fiscal year 2004 budget requests for its Highway Safety Research and Development Program is \$88.5 million, about a 23 percent increase over the \$72 million authorized for each of the fiscal years 1998 to 2003.

Federal Motor Carrier Safety Administration has requested \$7 million for fiscal year 2004 and FTA, the Transit Administration, proposes nearly \$50 million to carry out research and technology programs compared to a 2003 request that was over \$60 million.

Finally, the Research and Special Programs Administration, RSPA's fiscal year 2004 budget request includes \$32.5 million for the multi-moded University Transportation Centers program with which I know you are familiar and \$1 million in fiscal year 2004 to support work on developing technology for commercially viable hydrogen-powered transportation, or I should say DOT's role in regard to that.

The Department has made continual progress in research, management, and coordination that we know is of interest to this committee. It is critical that each operating administration conduct the research needed to support their individual missions. However, we have made progress, we believe, in coordinating these research efforts across the Department and in developing strategic direction for Department research. The ITS Joint Programs Office is a prime example of the many important Department-wide coordinating committees and collaboration for particular types of research. The Human Factors Coordinating Committee is another such example.

The Department-wide Research and Technology Coordinating Council shares information, facilitates joint research, reduces duplication, and serves as a forum for sharing results. The RTCC leads the preparation of the DOT Research, Development, and Technology Strategic Plan that is based upon DOT's Strategic Plan and annual performance plans. The fiscal year 2003 Research, Development, and Technology Strategic Plan, which was approved by Secretary Mineta in September 2002, reflects President Bush's goal of managing for results. Finally, in response to Secretary Mineta's determination to add strength, focus, and scope to the Department's policy-making capability, Congress authorized a new position, that of Undersecretary for Policy. The President nominated Jeffrey Shane for this position. He was sworn in to that position at the end of March. Improvements in both organization and process will result in an even stronger and more relevant program of research, technology, and education across the Department.

The President's 2004 budget shows that the Administration's commitment to the resources needed for research, technology, and education will be sought.

Mr. Chairman, this concludes my statement, and I will be pleased, at the conclusion of remarks by my colleagues on this panel, to answer any questions of you or your colleagues.

[The prepared statement of Mr. Frankel follows:]

PREPARED STATEMENT OF EMIL H. FRANKEL

INTRODUCTION AND BACKGROUND

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to testify today on the important contributions of the U.S. Department of Transportation (DOT) as you consider the role of research, technology and education in surface transportation reauthorization legislation.

Secretary Mineta has called for a *safer, simpler, smarter* transportation system. The development of new technologies is important to achieving such a system. The successful development and implementation of appropriate technologies is key to alleviating many of the problems facing society. The challenges of continued travel growth, greater accessibility, and enhanced safety may be best met by the proper use of new and emerging technologies.

The invention of a new device or a new way of operating is, we know, only a part of the task of developing new technologies. Too often, the hardest challenge is finding a way to encourage those changes to be adopted by users and operators of the system. Accordingly, we need to find ways to move technologies into the transportation system faster and encourage our stakeholders to accept new approaches to doing business. The Department of Transportation will partner with other government agencies, the private sector, and academia to enhance the process of transportation innovation and facilitate the speedy adoption of new technologies and new approaches.

A major portion of DOT's research agenda is to improve the operational mission of the Department and that of our public-sector partners—in particular, State and local governments and transit agencies who are DOT grant recipients. Other elements of DOT research are support our regulatory activities and policy agenda. Finally, some DOT-supported research is intended to assume some of the risks of innovation and to stimulate all our stakeholders—public and private—to adopt those innovations that appear to be successful, appropriate, and productive. In short, DOT's role in conducting research to address national problems stems from our stewardship role in using national resources wisely.

Most of our research agenda is relatively near-term. The pressing needs we currently face in safety, congestion and the environment are so important that we have to support immediate change. Nonetheless, we are mindful that our future ability to make short-term improvements depends on our willingness to commit some of today's scarce resources to the search for long-term solutions. Accordingly, while we are not principally a "science" agency, our organic legislation requires the Secretary of Transportation to "promote and undertake research and development related to transportation." We are mindful of the importance of ensuring that the process of innovation will continue, by providing support for some level of longer-term and basic research.

PAST SUCCESSES AND FUTURE VISION

The Department has already made considerable progress under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21) in changing highway and public transit operations. Under TEA-21, the Department of Transportation has made strides in research, including development and deployment of Intelligent Transportation Systems (ITS), pavement improvement, congestion reduction, seismic hardening of highway infrastructure elements, strengthening of bridges, and new tunnel technology. The Highway Safety Research and Development program is the scientific underpinning for the Department's national leadership in highway safety programs, and includes behavioral research to reduce traffic deaths and injuries, crash avoidance research, roadway design and operational improvements, and vehicle safety performance standards. Rail-related research and development has focused on the next generation of high-speed rail equipment and train control, and innovative technologies to mitigate grade crossing hazards. We will build upon the success of these

programs and extend the concept of “smart transportation” to the entire surface transportation sector.

The Administration’s surface transportation reauthorization proposal is still being refined and finalized in the Executive Branch Review process. We look forward to presenting our specific reauthorization proposal to you as soon as possible.

In the meantime, President Bush’s Fiscal Year (FY) 2004 budget provides the budgetary foundation for our reauthorization proposal and signals the importance placed on RT&E by the President and the Secretary. Total research, development and technology funds for DOT’s surface transportation modes totaled approximately three-quarters of a billion dollars. Although I cannot discuss the details of our six-year proposal, I would like to present to you some of initiatives projected for FY2004.

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

The FY2004 budget requests substantial increases in funding for research, and especially for the Surface Transportation Research Development and Deployment Program managed by the FHWA. The President asked for \$199 million for this program, approximately 30 percent above the FY2003 appropriated amount of \$153 million for the program. These resources will permit FHWA undertake its traditional programs such as structures, pavements, and safety, as well as emerging priorities and programs in policy, operations, asset management and environment and planning.

FHWA’s role in conducting research is to find ways to meet our highway responsibilities to the public by efficiently delivering the very best in safe, secure, operationally efficient and technically advanced highway facilities, while meeting our environmental responsibilities. FHWA’s research program is focused on the following priority areas: safety; infrastructure; planning, environment and realty services; transportation system management and operations; freight; policy; security; and training and education. In FY ’03 FHWA spent \$500,000 as a part of the multimodal DOT effort on climate change research, emphasizing the impacts of climate change on the transportation system.

FHWA also provides leadership for the intelligent transportations systems (ITS) research and technology program. TEA-21 authorized a total of \$603 million for ITS research for FY1998 to 2003, and significant progress has been made in applying this technology to our surface transportation system. TEA-21 called for development of a national ITS architecture to plan for regionally and nationally compatible deployments of ITS and, currently, 200 architecture development efforts are underway or completed. TEA-21 also called for the accelerated development of national ITS standards and, in the last four years, 51 standards have been approved and published. The TEA-21 authorization for FY2003 for ITS Research was \$110 million. The President’s FY2004 Budget requests \$121 million for this program. ITS research will place more emphasis on providing a stimulus to innovation and emphasizing initiatives with high payoff potential to users of the transportation system.

Improved operation of surface transportation systems will be a focus in reauthorization. ITS will have a major role in accomplishing this objective. The Department will foster a greater use of technologies that provide more relevant and real-time information to the traveling public. To address the issues of congestion, security, and emergency response, the Department not only has to complete the deployment of ITS infrastructure in metropolitan areas, but also needs to develop new partnerships with the public safety community and focus on managing the system for better reliability.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA)

The National Highway Traffic Safety Administration’s FY2004 budget request for its Section 403 program—which is the NHTSA Highway Safety Research and Development Program—is \$88,452,000—about a 23 percent increase over the \$72,000,000 authorized for Section 403 for each of the fiscal years 1998–2003.

A major priority will be behavioral research safety initiatives for increasing safety belt use and deterring impaired driving, which are the two most urgent requirements needed to reduce death and injury. Past research carried out under ISTEA and TEA-21 provided the basis for innovative intervention strategies for use nationwide. Currently, NHTSA will focus on special populations most at risk to determine appropriate countermeasures. In addition, NHTSA will examine methods for integrating high-visibility traffic law enforcement into the daily routine of State and community enforcement agencies.

NHTSA has a lead role in the Department-wide Intelligent Transportation Systems (ITS) program’s Intelligent Vehicle Initiative. Through this effort, which is funded through FHWA’s ITS Joint Program Office, NHTSA is working closely with

vehicle manufacturers to advance the availability of crash avoidance technologies on vehicles. These technologies are designed to assist drivers under hazardous situations and to help them avoid impending crashes. In addition, NHTSA is engaged in other joint efforts with other DOT operating administrations. Especially noteworthy are cooperative efforts with FHWA's safety office in the areas of speed, pedestrian safety, and crash data systems, and with the Federal Motor Carrier Safety Administration's (FMCSA) Commercial Vehicle Analysis Reporting System (CVARS) and its commercial vehicle safety enforcement program.

Other NHTSA research in FY2004 will focus on areas such as Impaired Driving; Occupant Protection; Pedestrian Safety, Bicycle and Motorcycle Safety; Enforcement and Justice Services; Emergency Medical Services (EMS); Highway Safety Research; Traffic Records, Driver Licensing & Driver Education; the National Driver Register, Data Analysis Programs; State Data Programs; and Motor Vehicle Crash Causation Survey (MVCCS).

On the last area, the Motor Vehicle Crash Causation Survey is a new survey that will collect up-to-date, real-world crash causation data to identify and understand motor vehicle crash factors that are integral to developing and evaluating crash-preventing countermeasures. The survey, which will update 25-year-old data to identify and understand events that lead to motor vehicle crashes. This knowledge is vital to the development and evaluation of crash prevention countermeasures.

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION (FMCSA)

FMCSA has a relatively new research program which, in FY2004, will support work in driver safety performance; commercial vehicle safety performance; carrier compliance and safety; safety systems and technology; cross-cutting safety initiatives; and security. The Research & Technology FY '04 Budget Request is \$7,000,000—virtually the same as received in FY '03.

In addition to these efforts to improve commercial vehicle safety using the knowledge from research and deployment of new technology, FMCSA has a multi-faceted education and outreach program. This includes traditional program and skills training for our State partners and local police on the mechanics of commercial vehicle enforcement such as inspections, data collection, safety enforcement, and drug interdiction.

FMCSA has embarked on broader scale education efforts to improve commercial vehicle safety through education designed to modify human behavior. For example, FMCSA initiated a national "Share the Road Safely" education campaign designed to educate the public about the very different operating characteristics of commercial motor vehicles and to teach them how to avoid collisions with large trucks and buses. Another example is a national "Safety is Good Business" campaign designed to share information with motor carriers and operators about the significant cost savings and increased carrier profits that can result from improved safety awareness, improved maintenance practices, and the adoption of best practices. This program evaluates its effectiveness through motor carrier safety improvements, reduced costs of unsafe behavior, and reduced highway crashes. Finally, FMCSA is working very closely with the Transportation Security Administration and other parts of the Department of Homeland Security to ensure the safety and security of motor coach and truck operations.

FEDERAL TRANSIT ADMINISTRATION (FTA)

The Federal Transit Administration partners with the transportation industry to undertake research, development, and education to improve the quality, reliability, and cost-effectiveness of transit in America and encourage increases in transit ridership. The President's Budget for Fiscal Year 2004 proposes nearly \$50 million to carry out these research and technology programs, including \$31.5 million for the National Research Program, \$8.3 million for the Transit Cooperative Research Program, and \$4 million for the National Transit Institute training programs. Their comparable FY2003 request was over \$60,000,000.

Other key areas for FTA will include a renewed focus on technical assistance to support transit agency efforts to increase ridership and continued efforts to help transit agencies better leverage federal investments in public transportation infrastructure. Additional areas of FTA research, technology, and education programs include joint partnerships with public and private research organizations, transit providers, and industry to promote the early deployment of innovation in public transportation services, management, and transit operational practices. FTA also supports projects to support advances in fixed guideway technologies, bus and bus rapid transit technologies, fuel cell-powered transit buses, advanced propulsion control for rail transit, and other types of technologies in development. Finally, through the Transit Cooperative Research Program (TCRP) of the Transportation Research

Board, FTA funds research directed to local problem-solving in service concepts, vehicles and equipment, operations, human resources, maintenance, policy, and administrative practices.

FTA also supports a Hydrogen and Fuel Cell Bus Initiative which is a broad-based, national effort to coordinate, consolidate, and rationalize the diverse efforts in hydrogen and fuel cell buses in order to accelerate its commercial viability, and to help accelerate the successful commercialization of hydrogen and fuel cells into other transportation applications. Projects include managing the development of a fuel cell bus propulsion system with UTC Fuel Cells, a hydrogen fueling station at SunLine Transit that could also support light-duty fuel cell vehicles, and funding for fuel cell buses FY2003 funding was \$10.1M and their FY '04 budget request includes \$25M for this program.

FTA will also support research to improve transit readiness for terrorist attacks, with particular focus on security training, public awareness and emergency preparedness. It will continue to support research to test and validate transit security technologies to prevent, reduce the impact of, and enhance the recovery from terrorist attacks. FTA will also continue to leverage the resources of the intelligence community, security professionals, the Department of Homeland Security, and others to address a variety of needs identified through security assessments conducted over the past year.

BUREAU OF TRANSPORTATION STATISTICS (BTS)

The Bureau of Transportation Statistics is responsible for developing transportation data and information of high quality and to advance their effective use in transportation research and policy formulation. It has a particular focus on multimodal and intermodal data and analysis. Although this is not really research it is funded out of Title V of TEA-21 and good research requires good data.

The FY04 budget request of \$35.5 million—\$31.5 million from the Highway Trust Fund and \$4 million from the Airport and Airways Trust Fund—reflects a proposal to sharpen the agency's focus on five core data programs and two crosscutting research programs. The data programs will develop useful, timely, and reliable freight, travel, economic, airline, and geospatial data. The research programs will develop and publish key indicators of national transportation system performance and provide long-term improvements to statistical and data collection methods to ensure the accuracy and usefulness of transportation data. Last year, BTS released TranStats which is an intermodal transportation database combining 100 key transportation data sets. This statistical resource has already been recognized with two top prizes—the Excellence.Gov and iForce Partner Excellence awards.

Next year, BTS will release findings from the National Household Travel Survey (NHTS)—a national survey of long-distance travel—which is a companion to FHWA's NHTS work on short-distance travel as well as results from the joint BTS–Census Bureau Commodity Flow Survey.

RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION (RSPA)

Finally, the Research and Special Programs Administration has a number of programs that are part of the Department's Surface Transportation Programs. In particular, RSPA is responsible for managing the University Transportation Centers program, which is funded out of FHWA and FTA surface transportation funding accounts. The UTCs perform transportation research projects in support of the Department's strategic goals in coordination with State and local governments, the private sector, and non-profit partners. UTCs also use research projects to help train the next generation of transportation leaders, and conduct education and technology transfer programs, all as part of the Department's strategy to meet America's need for a trained, technology-savvy future transportation workforce. The President's FY '04 Budget Request includes \$32,500,000 for this program compared to \$29,559,000 enacted in FY '03.

Another RSPA program associated with the surface transportation program is the Remote Sensing Applications to Transportation program, which it is undertaking in cooperation with the National Aeronautics and Space Administration (NASA). Through private-public-university consortia, RSPA is helping to bring the benefits of commercially available airborne and satellite-based remote sensing products to the transportation sector, and advancing the state of technology applications in infrastructure and asset management, intermodal traffic flows and operations, container security, environmental assessment and streamlining, and disaster assessment and emergency response.

RSPA has been managing an advanced vehicle technologies program and since 1999 has spent \$15 million on over 50 projects on various aspects of this program to improve energy efficiency and improve safety for medium- and heavy-duty vehi-

cles. RSPA coordinates DOT's in the Department of Energy's 21st Century truck project by cataloging and providing information and results of DOT research projects with bearing on 21st Century Truck Program objectives, and by participating in 21st Century Truck meetings.

RSPA has requested \$1,000,000 in FY2004 to support work on the President's goal of reversing America's dependence on foreign oil by developing the technology for commercially viable hydrogen-powered transportation. While the U.S. Department of Energy has a clear leadership role in implementing the President's new hydrogen fuel initiative, RSPA will address important hydrogen-related transportation and refining infrastructure.

CONCLUSION

The President's FY2004 Budget represents a strong commitment to excellent and adequately funded research and technology programs. Moreover, under ISTEA and TEA-21, the Department has made continual progress in research management and coordination that we know is of interest to this committee. We have made significant progress in coordinating the various research efforts across the Department and in developing a strategic direction for the Department's research. The ITS Joint Program Office is a prime example of the many important Department-wide coordinating committees and collaboration for particular types of research. Other examples include a human factors committee that shares information and results and, in many cases, coordinates joint research. Another area of collaboration across the Department is in environmental research.

In addition, the research, technology, and education undertaken by the Department are now being driven by our Strategic Plan and our annual Performance Plans. The coordination of research within DOT is accomplished by cooperation and consultation. The actual conduct of DOT research is undertaken by each operating administration in order to maintain its close applicability and relevancy to their programs. A Department-wide Research and Technology Coordinating Council (RTCC) provides a mechanism for sharing information on agency research programs, facilitates joint research activities, and provides the opportunity to share research results. The RTCC also leads the preparation of the *DOT RD&T Strategic Plan*, which identifies research priorities and shows the relationship between research initiatives and the Department's Strategic Goals and Performance Goals. The *FY2003 RD&T Strategic Plan* was approved by Secretary Mineta on September 16, 2002. This is helping to make the RT&E program more supportive of President Bush's desire to manage for results.

Finally, in response to Secretary Mineta's determination to add strength, focus, and intermodal scope to the Department's policy-making capability, the Congress late last year authorized the new position of Under Secretary of Transportation for Policy. It is Secretary Mineta's intention that this new position should serve as a more effective focal point for the coordination and harmonization of the policy and research activities of the different operating administrations and the Office of the Secretary itself. The President's nominee for the new position, Jeff Shane, was sworn in at the end of March. We are just now in the process of reorganizing the Department's policy function in keeping with Secretary Mineta's vision. Improvements in both organization and process will result in an even stronger and more relevant program of research, technology and education.

The President's FY04 Budget that you have already seen shows the commitment to the resources needed for research, technology, and education. I am confident the Administration's reauthorization proposal will address many of the programmatic and reform measures needed for an effective, efficient Research, Technology, and Education Program for these first years of the 21st Century.

Mr. Chairman, that concludes my statement, and I would be pleased to answer any questions from you or your colleagues.

Chairman EHLERS. Thank you. And I neglected to remind all of you that we do have an indicator light system. When it is green, you go. When it is yellow, you have a minute left. When it is red, you are in deep trouble. So—

Mr. FRANKEL. I probably went through a red light, I will bet.

Chairman EHLERS. At any rate, we—those are as an aid to you, and so we would appreciate if you would pay attention to those. Mr. Harm.

**STATEMENT OF MR. ERIC E. HARM, P.E., DEPUTY DIRECTOR,
DIVISION OF HIGHWAYS, ILLINOIS DEPARTMENT OF TRANS-
PORTATION**

Mr. HARM. Good morning, Mr. Chairman, Members of the Subcommittee. As introduced earlier, I am Eric Harm, Deputy Director of Highways at the Illinois Department of Transportation. Since 1985, I have overseen the Department's research program in various capacities.

Illinois, as with other states in the Nation, face enormous transportation research challenges. In the very near future, we have to figure out how to move more freight and more people on aging facilities that are already near or at capacity. We have to consider environmental, social, and economic impacts as well, and we have to do this while, at the same time, continuing to reduce accidents and save lives. Only with a strong federal transportation research program can we accomplish this.

Illinois DOT expends over \$6.5 million annually on research-related activities. The expenditures that we do are focused on definable problems where solutions can be identified in a short period of time, and I am sure other states are similar. Illinois' research has accomplished, through in-house staff, about 30 percent, universities, 60 percent, and private sector, about 10 percent. This mix keeps in-house staff expertise high, allows for access to university knowledge and expertise, gives students real world experience, and these students are probably our future transportation professionals and allows for the important private sector perspective on addressing our problems.

The states look to and expect a federal research program that is broad, fundamental, high-risk/high-payoff research that addresses the transportation issues we will have facing us five to 10 to 20 years from now. I compliment the Federal Highway Administration, FHWA, for changing its internal culture and now being more active in seeking stakeholder input into its research activities, but there is still room for improvement at the strategic program and individual project levels.

FHWA research has been productive in recent years. Some recent examples where FHWA research was used by Illinois are: one, to improve smoothness of our newly constructed and rehabilitated pavements and bridges; to prevent a bridge collapse similar to what occurred on the Hoan Bridge in Wisconsin; to examine impacts of alternative traffic control strategies to minimize traffic delays to the public; and to change material and construction procedures resulting in longer lasting bridges.

Illinois has been using innovative technology and computers to move and direct traffic more efficiently, which is often referred to as Intelligent Transportation Systems, or ITS, for over 40 years in the Chicago area. This effort started out as a research project. Today, this system is recognized as one of the premier systems in the country, and we continue to enhance it through the findings from State and Federal ITS research projects. Also in the area of Intelligent Transportation Systems, the federal funding leadership and facilitation of all of the stakeholders involved has been vital to the recent successes at all levels of ITS projects in Illinois, both at the local, regional, and state level.

But what is left to be done in transportation research? The use of our systems and modes of transportation is increasing rapidly. To address this increased use of systems, solutions have to be identified. Building more facilities is only one part of that solution. We also need to find innovative ways to move goods and people through the existing facilities we have. We need to find ways to include land use, urban sprawl, the environmental, and the economic development issues in appropriate manners.

The interaction between the various modes has to be improved. For example, rail freight traffic is increasing. That freight is ultimately moved by trucks to and from trains on our highway systems, so that intermodalness has to be addressed. These are only a few examples, but only with research and new approaches can we accommodate this phenomenal growth in the use of our systems.

Illinois supports the need for increased research funding at all levels and all modes, but the transportation is outlined in the research recommendations set forth in AASHTO's TEA-21 reauthorization policies for the various federal research programs. And we do have a document I would like to submit for the record from AASHTO.

[See Appendix 2: Additional Material for the Record for the information referred to.]

Mr. HARM. The role of the Federal Government in conducting transportation research should be of one, preserving and enhancing all modes of transportation research, accelerating the demonstration of new technology, facilitating all stakeholders in developing coordinated research strategies, providing stable and adequate funding levels.

In closing, the federal transportation research in the past has helped transportation professionals find solutions. And all levels in research will be vital to help the problems of today and the future. A strong federal transportation research program based on input by all stakeholders is necessary, and such a program must be funded at appropriate and stable levels to support high-risk/high-payoff research.

Thank you for the opportunity to testify today on this important issue.

[The prepared statement of Mr. Harm follows:]

PREPARED STATEMENT OF ERIC E. HARM

Mr. Chairman, Mr. Ranking Member and Members of the Subcommittee, I appreciate the opportunity to speak before you concerning the research priorities for the reauthorization of the Transportation Equity Act for the 21st Century (TEA-21). I am representing the Illinois Department of Transportation (IDOT) where I am the Deputy Director of Highways responsible for materials, construction, local agencies, and research functions on a statewide basis. I am currently a member of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Research and recently was the Vice Chair of AASHTO's Research Advisory Committee.

My testimony will address IDOT's research programs, what role the Federal Government, especially the Federal Highway Administration (FHWA) should have in conducting transportation research, and what gaps exist in the Nation's current transportation research agenda.

I would like to preface my remarks by emphasizing that transportation research is vital to the state of Illinois at the local, regional, state and national levels. Illinois is the transportation hub of the Nation. Given its central geographic location in the United States and historical prominence in agriculture, manufacturing, and commerce Illinois has developed an extensive and intensively used system of transpor-

tation and transportation services. There are over 288,000 lane miles of public highway in Illinois that carries over 102 million vehicles miles of travel annually. Overall, Illinois ranks third in total highway center line miles, third in total lane miles, seventh in vehicles miles of travel, and fifth in total population. IDOT provides technical assistance and administers state and federal funding to 50 public transit systems with 5,700 transit vehicles serving approximately 600 million passengers a year which includes the second largest public transit system in the Nation. With its 7,300 track-mile network, Illinois also has the second largest rail freight transportation system in the Nation. In addition, Amtrak provides 50 passenger trains per weekday serving 3.6 million passengers a year. Finally, Illinois' air transportation system, the second largest in the Nation, is comprised of 120 public-use airports, including Chicago's O'Hare International Airport, one of the world's busiest airports.

IDOT expends over \$6.5 million annually on research-related items. Illinois rarely performs fundamental research studies due to the higher risks involved and the lack of usable solutions within a reasonable time or budget. This means research activities are directed toward definable problems with solutions that can be applied with "off-the-shelf" technology or by means of limited development of new technology in a short period of time. Such solutions reduce cost, improve durability, reduce maintenance, reduce congestion, increase efficiency, extend the life, or improve safety of our transportation infrastructure. Currently the department's research budget is expended as follows:

Bridges:	27%
Pavement:	25%
Materials:	12%
Environment:	2%
Safety:	7%
Traffic:	23%
Transit:	4%

Illinois accomplishes this research through a strong in-house component of research (30 percent) along with university research (60 percent) based on funding grants. A limited amount of work is performed by the private sector (0 percent). It should be noted the in-house percentage represents only formal research activities. Due to the nature of engineering work and the challenges presented, a great deal of informal research is performed throughout the department in order to develop new and unique solutions to problems. For example, Illinois often takes research findings by others such as National Cooperative Highway Research Program (NCHRP), FHWA, fellow states, and/or international sources and applies them to problems within Illinois. This is the all important aspect of research called implementation.

Illinois has a long-standing cooperative research relationship with the University of Illinois to conduct highway-related research studies. In 1991, the department expanded our relationship with 11 Illinois public and private universities to support research in all modes of transportation. All entities involved benefit greatly from this cooperative relationship. The department benefits by gaining access to Master's and Ph.D. level expertise, the professors guiding the research gain expertise in real work issues, and the students and the transportation field gain by providing education and research opportunities to future transportation professionals. This relationship is important in the preparation of the student in the transportation field. These benefits can be multiplied over 50 times when you include all the other states and Federal Government research programs that utilize universities and colleges.

Over 15 years ago, when I first was involved with the FHWA research program as the department's research manager, Illinois and other states had very little input into the direction and the selection of FHWA research work. Today, the situation has changed. The FHWA is proactively seeking out stakeholder input into what the research needs are from a national perspective. I compliment FHWA for moving in this direction, but there is still room for improvement in providing more stakeholder involvement in setting priorities and resource allocation. This involvement should be at the strategic, program, and individual project levels.

The FHWA program should be one of broad, fundamental, high risk/high payoff research that will address the transportation issues that we will face five to ten to 20 years in the future. To be successful, funding commitment levels must be sustainable and must deliver the high risk/high payoffs we all expect. The federal transportation research program should be one that has the ability at the national

level to facilitate bringing the stakeholders together and develop the needed long-range high risk/high payoff research agendas.

Research is not effective unless the results are used. The implementation and benefits of any research project or program can be measured in many ways. Implementing research findings occurs by specification changes, policy changes, use of new or different materials and/or construction techniques, and new equipment and/or technology. Some recent examples of FHWA research results used by Illinois are:

- To improve the smoothness of our newly constructed and rehabilitated pavements and bridges.
- To prevent a bridge collapse similar to what occurred on the Hoan Bridge in Wisconsin.
- To examine impacts of alternative traffic control strategies to minimize traffic delays.
- To change material and construction procedures resulting in longer lasting bridges.
- To develop a temporary concrete traffic barrier without having to perform expensive crash testing.
- To develop designs for innovative roundabout intersections.

Illinois has been using innovation technology and computers to move and direct traffic more efficiently, which is referred to as Intelligent Transportation Systems or ITS, for over 40 years in the Chicago area. This effort started out as a research project. This system has evolved into what is now referred to as one of the premier systems in the world. More recently, the Gateway Traveler Information System, named the top traveler information Web site in the country by USDOT in 2002, resulted from implementing the results of state and federal funded research demonstration projects conducted in the 1990s. This system takes real time travel information from multiple agencies and sources and processes it into useful information for travelers and agency operational uses.

Throughout Illinois, we are using the National ITS Architecture championed and funded by the Federal Government to develop statewide, regional, and project specific specifications. This has enabled us to develop and implement non-proprietary protocols resulting in competitively priced, inter-operative system components which we can maintain cost-effectively. Without the federal funding, leadership, and facilitation, this could not have occurred.

While past research efforts have helped this nation achieve the great transportation infrastructure it has today, many issues remain. Many facilities are at or near capacity. We need to find new ways to move more goods and people through existing facilities. We have to address the intermodal movement of freight and its impacts on congestion. The issues of land use, urban sprawl, the environment, and movement of goods and people are more intertwined and complex than ever before. We have to expand the disciplines used to address these issues from the traditional civil engineering discipline. Disciplines such as human factors, land use, business and economic issues, and information management. As we expand into these other disciplines, the research areas and needs expand as well.

Noise from our facilities is an example of a definite gap in knowledge that multidisciplinary research can help. Noise not just from the use of our facilities, but also when we maintain, rehabilitate and/or reconstruct our facilities. There is very little knowledge on how to measure, what is measured, what is acceptable versus preferable levels of noise, how to reduce or eliminate noise. The answers to these questions will come from an interdisciplinary approach of human factors, acoustical engineering, mechanical engineering, land use and zoning issues, and traditional civil engineering.

While expanding more into the multidisciplinary research efforts, the more traditional research into asphalt, concrete and steel discipline cannot be forgotten. Continued research into these areas is needed to find more cost-effective designs, longer lasting facilities, and new materials that have not yet been invented.

There is room to expand transportation research. Currently only one half of one percent of highway expenditures (Federal, State, and local) is directed towards research whereas in other industries such as medical devices and computers it is 5–7 percent. Each state, as well as AASHTO, has research needs far greater than funding allows. The need for increased research has been identified by AASHTO during their review of the issues involved with reauthorization. In all aspects of current transportation research, AASHTO recommends sustaining or enhancing existing research programs in both funding levels and stakeholder input. Illinois supports the research funding recommendations being set forth by AASHTO in its TEA–21 Reauthorization Policies.

Future federal transportation research has to be one of sufficient levels that is stable to support the high risk/high payoff fundamental research that address the transportation issues this nation faces in five to ten to twenty years from now. The federal role in this expanded transportation research program should be:

- To preserve and enhance research in all modes of transportation.
- To accelerate application of new technology.
- To facilitate all stakeholder involvement for strategic, program and individual projects.
- To provide appropriate and stable resource allocations.

These items have to be accomplished at the federal level. Among the states and regions many of our problems are common and they should be attacked with national programs.

In closing, federal transportation research in the past has helped transportation professionals find solutions. Research will be vital to help face the problems of today and the future. A strong federal transportation research program based on input by all stakeholders is necessary and the program must be funded at appropriate and stable levels to support high risk/high payoff research.

Thank you for the opportunity to testify on this important issue.

Chairman EHLERS. Thank you. Dr. Walton.

STATEMENT OF DR. C. MICHAEL WALTON, ERNEST H. COCKRELL CENTENNIAL CHAIR, UNIVERSITY OF TEXAS AT AUSTIN, DEPARTMENT OF CIVIL ENGINEERING

Dr. WALTON. Good morning, Mr. Chairman, Members of the Subcommittee. I appreciate the opportunity to be here to discuss the national transportation research enterprise with you. As indicated, my name is Michael Walton. I am a faculty member at the University of Texas at Austin in Engineering and Public Affairs. In addition, I should mention that I have the honor of serving as Chairman of the Board of ITS of America, a regional Vice President with ARTBA, American Road and Transportation Builders Association, and a member of the National Transportation Policy Committee of the American Society of Civil Engineers in addition to the comments that the Chairman made as well with TRB. However, my testimony is my own and not that of any of the above affiliations.

My written testimony addresses five specific issues that you requested: the future of the Strategic Highway Research Program, F-SHRP; advanced research; stakeholder involvement; ITS; performance measures for research. And I will limit my remarks to selected aspects of each.

With respect to F-SHRP, the program is designed to be a special-purpose, time-constrained research program that complements other transportation research and technology programs and focuses on four strategic areas: renewal, which is accelerating the renewal of American highways, that is get in, get out, and stay out; safety, making a significant improvement in highway safety; reliability, providing a highway system with reliable travel times; capacity, providing highway capacity in support of the Nation's economic and environmental and social goals. The funding level for this program is recommended at \$75 million per year over the six-year period, assuming a six-year bill, and a recommended funding mechanism was the same that was used in the previous SHRP program in the 1980's and 1990's. There is an allocation process that was recommended for each of the four thrust areas, however, there is an AASHTO committee that is underway at this particular time com-

ing up with a detailed work program for each of those elements, and they, indeed, alter the recommended allocation.

Next, the advanced research topic, also referred to as exploratory, long-term, enabling or high-risk/high-payoff research, uses the results of basic or fundamental research often carried out in support of non-highway fields to better understand the highway problems and to spark more innovative solutions to these particular problems. The results of advanced research typically take several years to reach an implementable stage, and usually require additional applied research and development after that stage to make it effective in implementation.

Among several areas of which the—my committee, which as the Research and Technology Committee recommended, was that FHWA's program continue to focus on advanced research in particular and become a stronger part of their program. And indeed, there is a priority to do so, I believe.

Stakeholder involvement. Stakeholder involvement is another aspect of FHWA's need to be responsive to influence by major stakeholders. As was mentioned before, they have an active program underway making substantial progress. We believe there is opportunity for continued improvement.

In the ITS arena, in the implementation, while the ITS evaluation program, consisting of operational tests, self-evaluations, and national evaluations has been largely successful, one way to improve the evaluation process is to reform the mechanism for distributing ITS deployment funds. And I will speak to that in my summary.

Given the significant investment in intelligent vehicle research, some have asked why these technologies have not been transferred more quickly to the marketplace. There are too many—there are two primary reasons for this: cost and liability issues. What is recommended, perhaps, is that we take this head-on and suggest that we conduct a study that would, indeed, deal with the non-technical barriers, which suggest remedies to the liability concerns. Meanwhile, though, the ongoing federal research and operational tests should continue in parallel.

In summary, there are many entities at the national level that conduct federally funded transportation research with little coordination. To ensure that we meet national goals and to ensure that we are getting our money's worth for federal investments, we should take steps to maximize coordination and collaboration among each of the independent research programs. Therefore, I recommend that Congress consider the creation of a national strategic plan for highway and for transportation research and development. And my—this is expanded in my written testimony. The strategic plan would also be used by Congress to ensure that federally appropriated monies for transportation R&D issues to effectively and efficiently and in furtherance of national goals, and I would strongly recommend your consideration.

Again, I would like to thank you for this opportunity to address future needs of our transportation system and look forward to discussion. Thank you, Mr. Chairman.

[The prepared statement of Dr. Walton follows:]

Introduction

Good morning. Mr. Chairman and Members of the Subcommittee, I appreciate this opportunity to discuss future transportation research needs with you. My name is Michael Walton; I am the Ernest H. Cockrell Centennial Chair in Engineering, Professor of Civil Engineering with a joint academic appointment in the Lyndon B. Johnson School of Public Affairs at the University of Texas at Austin. Currently, I also have the honor of serving as the Chairman of the Board of the Intelligent Transportation Society of America (ITSA), as the Western Region Vice Chairman of the American Road and Transportation Builders Association (ARTBA) and as a member of the National Transportation Policy Committee of the American Society of Civil Engineers. I also chaired the National Research Council (NRC) Committee for a Study for a Future Strategic Highway Research Program and I currently chair another NRC committee that performs an ongoing review of the research and technology programs of the Federal Highway Administration. However, my testimony is my own and not that of any of the above affiliations.

I will focus my remarks on five specific issues: the Future Strategic Highway Research Program (F-SHRP), advanced research, stakeholder involvement, intelligent transportation systems, and performance measurement for research. Following a brief overview, I will go through each of these topics in turn.

Overview

For decades, several research programs have promoted innovation in the Nation's highway transportation system. The Federal Highway Administration, state departments of transportation, and the National Cooperative Highway Research Program constitutes the largest of these programs and provide research and technology services across a wide spectrum of highway and transportation related disciplines. Beginning as part of the 1991 Intermodal Surface Transportation Act (ISTEA), and continuing as part of the Transportation Equity Act for the Twenty-first Century (TEA-21), the federal Intelligent Transportation Systems program has directed the development and deployment of advanced communications and information technologies across all modes of the surface transportation system to address safety, security, and mobility needs. Another successful example is the University Transportation Centers program. This program is essential to developing the next generation of transportation researchers and professionals and is often a source of researcher-initiated, rather than mission-agency-initiated, research.

In addition, special-purpose research programs have been developed to concentrate additional resources on a small number of especially pressing problems. The American Association of State Highway Officials (AASHO) Road Test in the late 1950s and 1960s developed design standards for the nascent interstate highway system. The first Strategic Highway Research Program (SHRP), in the late 1980s and early 90s, addressed selected critical infrastructure and operations problems faced by state highway agencies. The proposed Future Strategic Highway Research Program (F-SHRP) is aimed at a set of issues facing the highway community at the beginning of the 21st century.

Future Strategic Highway Research Program (F-SHRP)

The Future Strategic Highway Research Program (F-SHRP) is designed to be a special-purpose, time-constrained research program that complements, but does not replace, other transportation research and technology (R&T) programs by concentrating additional resources at a larger scale on a few strategic focus areas to accelerate solutions to critical problems.

At the request of Congress, the Transportation Research Board (TRB) established a committee to study the need for such a program. The study committee conducted an extensive outreach process to identify highway needs and research opportunities. Stakeholders representing user groups, the private sector, various interest groups, and universities, as well as federal and local agencies and all state departments of transportation, participated in the outreach process. Through this process, the committee identified research areas where results can have a significant impact on highway system performance and recommended the establishment of a Future Strategic Highway Research Program comprising the following research program goals in four strategic focus areas:

Renewal: Accelerating the Renewal of America's Highways—After decades of constant use, much of the highway system is in need of extensive renewal, which must often be performed while the facilities remain in service. The public demands that this work be done quickly, with as little social and economic disruption as possible. The objective of the F-SHRP Renewal research is to provide

transportation agencies with integrated strategies to renew aging infrastructure rapidly and with minimum disruption to users. These strategies will package together optimal combinations of design approaches, information technologies, construction and operations methods, materials and equipment, financing techniques, impact assessment, project management, and public involvement. The research will also provide agencies with tools to characterize renewal projects; to determine which projects require special rapid, minimum disruption strategies; and to decide which strategies to use for each type of project.

Safety: Making a Significant Improvement in Highway Safety—Each year approximately 42,000 people are killed on the Nation's highways, and three million are injured. The cost of these crashes approached \$182 billion in 1999. While progress has been made in highway safety during the last several decades, increases in vehicle-miles traveled (VMT) threaten to drive up the absolute numbers of fatalities and injuries even as fatality and injury rates fall. The Safety research is intended to provide fundamental knowledge about major crash types in order to open up a new path for safety improvements. The research will focus on run-off-the-road and intersection crashes, which account for more than half of all highway fatalities. The major focus of the effort is on analysis of driver risk-taking behavior, including how drivers respond to geometric, roadside, operational, vehicular, and other circumstances. The research will use advanced technologies to gather pre-crash and crash data as well as exposure data.

Reliability: Providing a Highway System with Reliable Travel Times—Highway usage and congestion are growing in many areas of the country. Congestion makes the highway system more susceptible to unforeseen variations in travel time while users have become much more sensitive to such variations. The Reliability part of F-SHRP is aimed at improving the reliability of highway travel times by reducing the impact of events that cause travel time to vary from day to day. The research will address multiple causes of this variation: crashes, breakdowns, work zones, weather, special events, and hazardous materials spills. It will produce strategies and technologies to prevent non-recurring incidents, where possible; to respond more quickly and effectively to those that cannot be prevented; and to mitigate their impacts on mobility and safety.

Capacity: Providing Highway Capacity in Support of the Nation's Economic, Environmental, and Social Goals—Given anticipated growth in population and travel and a projected doubling of truck tonnage by 2020, selected additions to highway capacity are warranted. However, provision of new highway capacity must explicitly consider the relationships between highways and the economy, communities, and the environment. The objective of the Capacity portion of F-SHRP is to develop tools and approaches to systematically integrate environmental, economic, and community requirements into the highway analysis, planning and design process. The research will lead to better and faster decisions about new highway capacity and will provide transportation agencies with tools to deliver this capacity to communities.

These four research focus areas address the most critical facing state and local transportation agencies and represent the concerns that are most important to highway users: safety, congestion, and livable communities. While existing research programs have addressed aspects of these problems in a piecemeal fashion, to achieve meaningful solutions to these problems, additional scientific and technological must be brought to bear in a more focused manner. Each problem area is multidisciplinary in nature and includes institutional and social science aspects, making them difficult to address in a comprehensive manner in existing programs, which are most effectively organized along disciplinary lines.

The F-SHRP committee recommended a funding level of \$75 million per year over a six-year period. The committee further recommended that the funding mechanism should be a percentage takedown from the federal-aid highway funds apportioned to the states. This is the same mechanism that was used to fund the first SHRP during the 1980s and 1990s. The committee's initial recommendation is that F-SHRP funding be distributed as follows: 25 percent for Renewal, 40 percent for Safety, 20 percent for Reliability, and 15 percent for Capacity. A follow-up planning activity is currently underway, employing four technical panels and an oversight panel, to develop detailed research plans and possibly to revisit this funding distribution.

Precisely because of the nature and criticality of these issues and because the state departments of transportation have indicated a willingness to forego construction money to fund this research program, the F-SHRP committee recommended that the program be administered independently of existing research programs. The

Transportation Research Board's F-SHRP committee has made no recommendation as to program administration, other than to suggest that it be administered independently of existing research programs. However, the American Association of State Highway and Transportation Officials' F-SHRP Task Force has recommended that the National Research Council (NRC) administer the F-SHRP program. This would allow F-SHRP to function with sufficient autonomy and would offer protection from the shifting short-term priorities or annual funding decisions that hamper the effectiveness of other transportation research programs. At the same time, the NRC is well-equipped to manage a large-scale contract research program using open solicitation and merit-based selection of research proposals. Its institutional structure is flexible enough to not only involve stakeholders, but also to engage them in the actual governance of the program. Through its Transportation Research Board, the NRC is well positioned to coordinate F-SHRP with other highway research programs.

Advanced Research

Advanced research (also referred to as exploratory, long-term, enabling or high-risk/high-payoff research) uses the results of basic or fundamental research, often carried out in support of non-highway fields, to provide better understanding of highway problems and spark more innovative solutions to those problems. The results of advanced research typically take several years to reach an implementable stage and usually require additional applied research and development to get to this stage.

Examples of current advanced research being pursued at the Federal Highway Administration (FHWA) include: a feasibility study on the use of nanoscale sensors to measure performance characteristics of concrete and other construction materials; various materials research projects, for example, research into the chemical and physical processes that cause alkali-silicate reaction (which damages concrete); investigation of nondestructive testing techniques, such as magnetostrictive sensing to locate defects in steel structures and fiber-optic sensors to measure strains, temperature, moisture, and other variables associated with the performance of bridge structures; research using advanced materials characterization techniques, such as heavy ion beams and neutron scattering, to develop better control of construction materials performance through better understanding of microstructures and chemical processes that take place at the microscopic level; a feasibility study on the use of neural networks to develop a warning system for drowsy drivers; research on advanced methods for traffic modeling; and application of data visualization tools to understand complex data sets, for example concerning pollution from individual vehicles.

These are just a few examples from a very small program at FHWA, which it has nurtured for a number of years. However, the complexity of the problems we are facing in the highway field and the sense that we may have exhausted most of the more obvious solutions suggest that a greater investment is needed in pursuing more fundamental approaches. In addition, advanced research in transportation-related social science, such as travel patterns, traveler decision-making, and driver risk-taking behavior, should also be pursued.

Among several areas on which my committee has recommended FHWA's program to focus, advanced research in particular should become a stronger component of FHWA's program. FHWA is identified as the home for this type of research for several reasons. The long-term horizon for applicable benefits from advanced research means that the private sector has little incentive to pursue high risk, advanced research. State DOTs are generally consumed with addressing the myriad immediate issues proper to agencies that own and operate complex, extensive transportation systems; their research funds are largely focused on solving short-term problems associated with their day-to-day operations. Advanced research can be carried out at universities and in federal laboratories; in fact, FHWA does carry out its advanced research program in partnership with universities, NSF, and other federal agencies. However, FHWA is the only federal agency with a mission that involves national-level responsibility for highways; only FHWA is best positioned to initiate research into application of advanced technologies and scientific concepts for *highway* needs.

Stakeholder Involvement

My next topic, stakeholder involvement, is another issue my committee has addressed in the context of FHWA's research and technology program. The committee believes that FHWA needs to be more responsive to and influenced by major stakeholders in highway innovation.

There are many types of stakeholders for FHWA research programs. There are two primary categories of external stakeholders: (1) users (those who directly use

the results of the research), which include state DOTs, local governments, and the many private sector firms involved with delivering the transportation system; and (2) scientific and technical experts who conduct and review the research and who may come from a wide variety of fields, such as engineering, economics, biology, and many more.

Involvement of users and experts at the front end of the research process can help focus research on top priorities and take advantage of scientific and technological opportunities. During conduct of the research, experts can review progress for scientific quality and users can ensure that the research remains focused on critical needs. Involvement of ultimate users throughout the process also increases the probability of successful implementation of research results once the research is completed.

Historically, FHWA programs have employed some degree of stakeholder involvement; however, this involvement has not always been consistent in quality or quantity across and within programs. When stakeholders have been involved, it is often in an informal manner, perhaps only involving technical level personnel, and often did not employ sufficiently transparent processes so that the wider community could be assured that its interests were represented. FHWA has recently embarked on a plan to improve stakeholder involvement, through the R&T Partnership Forum. The Forum has brought together dozens of highway stakeholders to identify research needs across a wide spectrum of issues. Just last week, my committee sponsored a symposium that was a kind of follow-up to the Partnership Forum. FHWA should continue efforts to improve stakeholder involvement by taking an inventory of its current stakeholder involvement processes. Then it could analyze existing methods along the following lines: identification and representation of the relevant stakeholders, involvement at critical stages of the research process, consistency across program areas, transparency of the process, and documentation of the processes and outcomes of stakeholder involvement. This analysis would reveal the specific areas where there are gaps in the stakeholder involvement process; materials provided by the RTCC could be used to suggest possible ways to fill these gaps.

Another approach is the use of a Federal Advisory Committee. A successful example of stakeholder involvement has been the coordination of multimodal transportation research through the ITS Joint Program Office of the U.S. Department of Transportation. The Joint Program Office ensures that ITS research, standards, architecture, and deployment activities have input from all modal administrations. The Department has also achieved unparalleled stakeholder input from the public, private, and academic sectors through its relationship with the Intelligent Transportation Society of America (ITS America). For over twelve years, ITS America has served as a utilized Federal Advisory Committee to the U.S. Department of Transportation, providing input on the future direction of the federal ITS program. ITS America gathered technical, scientific, and programmatic advice from a vast array of stakeholders from states, counties, cities, metropolitan planning organizations, non-profit institutions, universities, and companies from the automotive, telecommunications, information technology, and transportation sectors. Through this partnership with ITS America, the Department has received valuable stakeholder input on a multitude of subjects, including the ITS architecture, ITS standards, future research needs, and deployment priorities. This successful public-private partnership should be seen as a model for future stakeholder involvement in transportation research and program delivery.

In recent months, the Department of Transportation has terminated ITS America's Federal Advisory Committee status. While active, the ITS America Advisory Committee had served as one of the few successful mechanisms for gathering robust and diverse stakeholder input on future surface transportation research. It is my understanding that another form of receiving advisory guidance and stakeholder advice is being considered as the ITS program management is re-organized within the Department of Transportation.

ITS

Improving ITS Evaluations

The enactment TEA-21 expanded the focus of the Intelligent Transportation Systems (ITS) program from one of research and operational tests to one that includes deployment. Subtitle C (Intelligent Transportation Systems Act of 1998) under title V of TEA-21 required the Secretary of Transportation (Secretary) to issue guidelines and requirements for the evaluation of operational tests and deployment projects carried out under the program. These evaluations help the U.S. Department of Transportation to assess the efficacy of the federal investment in ITS and help states and local governments understand the relative benefits and costs of deploying ITS systems.

Generally speaking, there are three types of evaluations for ITS deployments:

1. *Operational Tests*—Operational tests of the intelligent vehicle and intelligent infrastructure technologies are designed for the collection of data to permit objective evaluation of the results of the tests, derivation of cost-benefit information that is useful to others contemplating deployment of similar systems, and the development and implementation of standards. Funding for these operational tests is provided directly by the ITS Joint Program Office.
2. *Self-Evaluations*—Participants in the ITS Deployment Program regularly conduct locally executed and funded evaluations under the auspices of the project partners. These self-evaluations, also identified as local evaluations, incorporate certain minimum evaluation and reporting requirements. Cross-cutting assessments of these local evaluations are conducted by the ITS Joint Program Office.
3. *National Evaluations*—National evaluations are formal, in-depth, independently conducted evaluations of operational tests of intelligent infrastructure systems and selected projects carried out under the ITS Deployment Program. These evaluations supplement and expand on the activities of self-evaluations. National evaluations are conducted under the auspices of U.S. DOT, and are closely monitored by a designated U.S. DOT representative. Projects selected for national evaluations use a pooled funding mechanism. During each year authorized by TEA-21, two percent of the amount authorized for the ITS Deployment Program is placed into a deployment evaluation fund. National evaluations for selected projects are funded by this account.

Data and results gathered from operational tests, self-evaluations, and national evaluations is used by the U.S. Department of Transportation and by state and local transportation agencies to analyze deployment successes and lessons learned. Information gleaned from these evaluations is also shared with the public, via Internet-accessible ITS costs and benefits databases (<http://www.benefitcost.its.dot.gov/>). These databases have proven to be an invaluable tool for implementers of ITS systems, and for communities making the decision whether to invest in ITS.

While the ITS evaluation program has been largely successful, there is room for improvement. One way to improve the evaluation process is to reform the mechanism for distributing ITS deployment funds. Since the enactment of TEA-21, federal resources for ITS deployments have been applied thinly to a myriad of minor projects. This is, in part, attributable to the annual “earmarking” of the ITS Deployment Program, to fund multiple projects, each limited in scope. In addition to degrading the national focus of the ITS Deployment Program, this phenomenon has produced redundant and repetitive project evaluations, yielding overlapping and limited benefits data.

Currently, evaluations focus on small-scale projects or integrations, such as the deployment of a traveler information system or an arterial management system in a given metropolitan area. Such evaluations have a limited utility. A more focused deployment program, one that concentrates federal resources on deploying multiple ITS technologies in a single locality, could yield much more useful benefits data. An evaluation of such a large-scale project would help researchers and transportation planners to understand the potential synergistic impact that fully-integrated, multi-modal, ITS deployment could have on an area’s surface transportation system. This would be a more prudent and efficient use of limited evaluation resources.

Toward an Integrated Network of Transportation Information

A roadmap for this large-scale deployment already exists. ITS America, as part of its *Ten Year Program Plan for ITS*, proposed focusing future federal funding for the ITS program on the creation of a nationwide “Integrated Network of Transportation Information.” The Network would collect, analyze, and disseminate system performance information from a variety of sources, including highways, transit systems, rail lines, trucking fleets, first responders, wireless phones, toll tags, in-vehicle telematics services, parking systems, border crossings and other sources. Integrating these disparate streams of data into a seamless network would produce a much more accurate picture of what is happening on the surface transportation system at any given time, anywhere in the Nation.

Data drawn from the Network could be used to dynamically operate the surface transportation system at peak efficiency. Transportation planners could archive and analyze rich veins of historical system performance data to plan future infrastructure investments. Drivers, transit riders, and other travelers would have direct access to robust traffic data through web-based and wireless consumer services. Com-

panies could likewise tap into this network of transportation data to better manage their logistics, yielding unprecedented economic efficiencies in goods movement.

The proposed national system would synthesize both existing information sources as well as integrate new sources, as they become available. New sources would include numerous additional real-time data feeds (weather, traffic, etc.) and infrastructure elements (such as sensors installed in the pavement) as well as public safety systems, moving “probe” vehicles (under development by the automobile industry), or portable devices such as wireless phones or PDAs, etc. The national information system would collect, catalog, and store data regardless of source or format, and disseminate information to system operators and travelers alike utilizing a uniform reporting format. This effort would include acceleration of the deployment of the Commercial Vehicle Information Systems and Networks Model Deployment Initiative (CVISN), thus maximizing the effectiveness of the information provided to state truck inspectors. Once means of gathering the information are established, a pilot Web-based system should be created to provide access to the data on the regional and national levels.

In the reauthorization of TEA-21, the focus of the federal ITS program should be the creation of this Integrated Network of Transportation Information. While deployment of such a network on a national scale might be infeasible over the short time horizon, it would be quite feasible to demonstrate such a network in one or two regions or metropolitan areas. I would strongly urge the Congress to consider, as part of the reauthorization of the federal ITS program, concentrating available research and deployment resources on the creation of this network, and on its deployment on a limited, regional basis.

Focusing funding from the ITS Deployment Program on these regional deployments of integrated networks would accomplish the following:

1. Ensure that the ITS Deployment Program is not degraded;
2. Demonstrate the synergistic benefits of a fully integrated system for the entire surface transportation system;
3. Focus project evaluation resources on one or two large-scale projects;
4. Leverage federal investment through cooperation with private sector stakeholders; and
5. Integrate the advances in intelligent vehicle and intelligent infrastructure systems.

Intelligent Vehicle Initiative and Technology Transfer

One of the more successful elements of the current ITS research program has been the Intelligent Vehicle Initiative. Authorized under TEA-21, the Intelligent Vehicle Initiative (IVI) is a U.S. Department of Transportation program that aims to prevent crashes by helping drivers avoid hazardous mistakes. IVI exists to accelerate the development and commercialization of vehicle-based driver assistance products that will warn drivers of dangerous situations, recommend actions, and even assume partial control of vehicles to avoid collisions. The IVI is a cooperative effort between the motor vehicle industry, academic institutions, and four agencies of USDOT: Federal Highway Administration, the Federal Motor Carrier Safety Administration, the National Highway Traffic Safety Administration and the Federal Transit Administration.

The program’s goal is to dramatically reduce the 5.2 million injuries and the excessive and unacceptable highway-related fatalities experienced each year by studying the use of intelligent vehicle technologies such as collision warning systems, lane-departure warning systems, and adaptive cruise control. The IVI program coordinates research and operational tests of these technologies on consumer automobiles, transit vehicles, heavy-platform vehicles, and special vehicles, such as snowplows. There are eight problem areas currently under study by the IVI program: rear-end collision avoidance; lane change and merge collision avoidance; road departure collision avoidance; intersection collision avoidance; vision enhancement; vehicle stability; driver condition warning; safety impact services. Some of these technologies are still undergoing operational tests.

While the federal funding for IVI research has been limited, this small investment has been augmented by investment from partner companies in the automotive industry that contribute both funding and technical expertise to the program. Such an innovative and cooperative approach to funding transportation research, not only leveraged the federal investment, it forges partnerships with the very automotive companies that will ultimately adopt and deploy these potentially life-saving technologies. Additionally, the IVI program’s pre-competitive research on human factors and driver workload issues is a necessary precursor to private sector investment in intelligent vehicle technologies.

A recently announced IVI operational test illustrates the benefits of this cooperative, public-private approach. Eighty Michigan drivers will take part in a test of vehicles equipped with both forward collision warning and adaptive cruise control systems. (It is estimated that forward collision warning and adaptive cruise control systems could help drivers avoid or reduce the number of rear-end crashes, which account for about twenty-nine percent of all police-reported crashes). The U.S. Department of Transportation (DOT), GM and Delphi Automotive are all contributing funding to the \$35 million project, and the University of Michigan Transportation Research Institute is managing the field test and analyzing the data. GM led the integration of the system and the assembly of the test vehicles. GM and Delphi Delco Electronics provide the technical application in adaptive cruise control, forward collision warning and driver interface. DOT, which is providing funding through a cooperative agreement, has a responsibility to contribute technical information and provide other support.

This cooperative approach to the IVI program has led to a measure of success in advancing deployment of these technologies. It is estimated that 10,000 light vehicles equipped with adaptive cruise control (a technology transfer from the IVI program) have been sold in the United States, with Daimler-Chrysler, Nissan, Ford, and Toyota each having introduced models equipped with this technology. Collision warning systems are an example of a successful technology transfer for commercial vehicles. Over 50,000 trucks have been sold in the United States, equipped with forward collision warning systems. Other life-saving technologies that are on the market as a result of the IVI program include blind spot monitors for trucks, lane departure warning systems for cars, and night vision. Still more IVI technologies have been deployed in Europe and Japan, but not yet in the domestic market.

Given the significant investment in intelligent vehicle research, some have asked why these technologies have not been transferred to the marketplace more quickly. There are two primary answers to this question: cost and liability concerns.

Consumer acceptance of intelligent vehicle devices, in terms of the function, is generally not a problem. Consumer acceptance in terms of price is another matter. Japan, for example, has many more intelligent vehicle technologies available on the market because consumers there are willing to pay much more for safety systems. Therefore, cost to the consumer remains a major challenge to the adoption of potentially life-saving technologies. While the marketplace may eventually remedy this problem on its own, waiting for the market to reach that equilibrium could forgo the opportunity to save lives that we could achieve with a more rapid adoption of intelligent vehicle technology.

One option for advancing deployment is to subsidize this cost to consumers through some form of a tax incentive. A tax incentive could be provided to consumers who choose to purchase vehicles equipped with proven intelligent vehicle safety devices. There is precedent in providing tax incentives to consumers who purchase hybrid-electric vehicles. The same principle could work in this instance.

There is also a widespread perception among automotive manufacturers that intelligent vehicle technologies may expose automakers to product liability litigation. This concern has tempered the zeal of automakers to manufacture and sell cars equipped with these potentially-life saving devices. It is worth noting that most intelligent vehicle technologies on the road today were first deployed in Europe and Japan, countries that are perceived to be less litigious than the United States. I can make no recommendation on the merits of products liability reform. I would only note that industry concern with this issue is particularly deep and pervasive with respect to intelligent vehicle technologies; as such, this perception represents a significant non-technical barrier to deployment.

One option that would allow the Congress to address both cost and liability concerns would be to authorize a study to seek answers. The Congress should direct the Secretary for Transportation to conduct a study of non-technical barriers to the deployment of intelligent vehicle technologies, including liability concerns. This study, to be conducted in cooperation with private-sector stakeholders, should seek to identify reasons why intelligent vehicle devices are more quickly deployed in Europe and Japan. Any study of non-technical barriers these should not impede ongoing federal research and operational tests. Rather, cost and liability issues should be addressed in parallel with continuing research and development.

Performance Measurement

The last topic I was asked to address has to do with the benefits we receive from our transportation investment and how we can measure the return on that investment. This is a natural question and one that has been difficult for all institutions that sponsor or engage in research.

The difficulty of measuring research results stems from several aspects of the research endeavor. To begin with, any outcome you are interested in—safety, mobility, congestion, economic vitality, environmental protection, etc.—is going to be influenced by many factors including research. The research itself will typically be carried out over a long period of time, each research project building on previous research. The complexity of the causal chain between any particular research investment and the ultimate desired outcome makes it difficult to tease out in retrospect the exact contribution from each research project. The uncertainty of the outcomes of research projects and programs together with all the other social, economic, and political factors that will influence ultimate outcomes also makes it difficult to predict the benefits of research. In addition, sometimes “successful” research tells us that a particular idea is *not* going to work. The benefit of any research oriented to fundamental knowledge is difficult to measure because of the intangible nature of knowledge.

With these considerations in mind, there are some methods that are typically used to assess the value of research investments. A typical way of gauging the adequacy of overall investment in research is to convert this investment to a percentage of revenue or sales and compare this percentage to similar industries. In the case of the highway industry, research investment is about 0.5 percent of the total highway revenues, well below most mature industries. As a colleague, Martin Wachs, pointed out at last week’s symposium, transportation and health care account for approximately equal portions of the Gross Domestic Product, yet federal investment in health care research and development is ten times larger than federal investment in transportation research and development.

To evaluate the contribution of a wide range of research efforts to a significant outcome, one can compare the output of the relevant research efforts to indicators of the ultimate goals sought. For example, over a thirty-year period the highway fatality rate (in fatalities per 100 million vehicle-miles traveled) fell by about 70 percent. During this period, from the late sixties to the late nineties, improvements such as safety belts, air bags, break-away sign poles, redesigned guardrail, roadside design standards, more visible pavement markings and highway signs, were implemented that were the results of federally-funded research. While it is difficult to trace numbers of lives saved to particular research investments, there is a logical connection that suggests that the research investment paid off very well.

Another approach is to measure a sample of research projects or programs, comparing the cost of the program to some set of measurable outcomes. In a robust research program, usually a small number of the most successful projects more than pays for the whole program.

The first SHRP program, funded at \$150 million over five years, produced well over 100 research products. While no comprehensive evaluation has been made of all the products, two major segments of SHRP research have been very successfully implemented by state DOTs. The Superpave® system of asphalt binders and mixes is currently used in over half the pavements constructed by the state DOTs. Superpave is expected to increase pavement life by about 50 percent. While sufficient time has not gone by to see if this life extension has taken place, states feel they have enough data already to use Superpave so extensively. Snow and ice control technologies promoted by SHRP have led to agency savings in reduced personnel and material requirements ranging from \$1,300 to \$30,000 per truck route, depending on the severity of the storm. Communities and users have avoided billions of dollars in economic losses from having roads clear and open to travel more quickly; on a per truck-route basis, these savings ranged from \$12,000 to \$107,000.

As valuable as it is to measure such benefits after the fact, it is also important to evaluate research programs as they are being carried out. This has been a major issue at the federal level due to the passage of the Government Performance and Results Act. While various agencies use different approaches, the two essential aspects of research program performance measurement are quality review and relevance review. Quality review, or peer review, is carried out by experts who can evaluate the scientific and technical quality of the research. Relevance review is carried out predominantly by users and is intended to keep the research focused on the intended goals. These types of review link back to the concept of stakeholder involvement, since they are also its main components.

Evaluation of research, both during its conduct and after it has produced results, is easily overlooked. Researchers usually like to go forward, not look back. If more attention to measuring results is desired, it may need a specific focus. Time, funding, and personnel—which need only be at modest levels—could be built into large research programs.

A National Strategic Plan for Transportation Research and Development

In summary, there are many entities at the national level that conduct federally funded transportation research with little, if any, coordination and collaboration. The U.S. Departments of Transportation and its entities along with others, each conduct their own transportation research efforts, somewhat coordinated of the others' efforts. Additionally, state departments of transportation and universities also engage in publicly funded transportation research. Moreover, private industry routinely conducts transportation research—often at their own expense. Such a patchwork and fragmented approach to funding transportation research limits our nation's ability to meet national goals such as mobility, safety, economic vitality, system preservation, and environmental protection. Experiences with various clearinghouse approaches are typically underfunded and problematic.

To ensure that we meet national goals and to ensure that we are getting our money's worth from federal investments, we should take steps to maximize coordination and collaboration among each of these independent research efforts. Therefore, I recommend that the Congress consider the creation of a National Strategic Plan for Transportation Research and Development. Such a plan should delineate national research goals and should provide a roadmap for achieving these goals. The Strategic Plan should be created in cooperation with private and public sector stakeholders engaged in transportation research and should address strategies for facilitating coordination among independent research programs. While this plan would seek only to address domestic research, it should give consideration to future and ongoing international transportation research. Characteristics of an effective strategic plan for transportation research and development:

- The plan should focus on the highest priority needs identified at a national level. Other important research work will be conducted in concert to the strategy.
- The strategic plan should employ rational criteria and methodologies in prioritizing and budgeting for R&T programs.
- Specific R&T activities should be tied explicitly to the goals in the strategic plan and their relationship to these goals should be clearly articulated. This connection to the strategy should be apparent in the detailed plans or roadmaps developed for specific research activities.
- The strategic plan will not only identify what should be done and why; it is will also provide clear guidance on what will not be done.
- The plan should involve a careful analysis of the appropriate stakeholders to be involved and at what levels of formulating the plan.
- The plan should reflect substantive knowledge of research activities outside of the department, including internationally.
- The plan should be linked to funding allocations. Budget decisions are a tangible reflection of real priorities.
- The plan should be a public document.
- The plan should be concise.
- The planning process should be dynamic and continuous: a multi-year plan should be developed but it should be assessed annually to ensure it's continued relevance.
- The planning process may be most effectively carried out with assistance from outside the department (for example, from the NRC).

A National Strategic Plan for Transportation Research and Development would be useful for more than simply outlining national goals and coordinating independent research efforts. The Secretary for Transportation could use the plan to more efficiently direct research funding within the U.S. Department of Transportation and assist the states in providing data and information, clearinghouse or R&D activities and technical guidance as they devise their individual R&D agendas. The Strategic Plan could also be used by the Congress to ensure that federally appropriated money for transportation R&D is used efficiently and furtherance of established national goals. I would strongly urge the Congress to consider the creation of such a strategic plan as vitally important to the future of transportation research.

Again, I would like to thank you for this opportunity to address the future research needs for our surface transportation system. I look forward to working with the Committee as we move forward in ensuring that the reauthorization of TEA-21 sufficiently addresses these very pressing research needs. I would be happy to answer any questions you may have or to follow up with additional information at a later time.

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Chairman EHLERS. Ms. Siggerud.

STATEMENT OF MS. KATHERINE SIGGERUD, ACTING DIRECTOR, PHYSICAL INFRASTRUCTURE TEAM, GENERAL ACCOUNTING OFFICE

Ms. SIGGERUD. Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to testify today on the Federal Highway Administration's Research and Technology Program. I am also honored to be part of such a distinguished panel today.

Expectations, as you have pointed out, for the Federal Highway Research Program are high, and the Congress has devoted considerable resources to it. For example, approximately half of all of the resources allocated to the Department of Transportation in 2002. As the Congress undertakes reauthorization of TEA-21, it is important to consider whether the agency is conducting the high-quality research that is relevant and useful to its stakeholders.

My testimony is based on a report GAO issued last year that included recommendations to federal highways aimed at improving its processes for setting research agendas and evaluating its research efforts. I will also provide information on the actions FHWA has taken since we issued our report. My statement will cover, first, the best practices we identified for developing research agendas and evaluating research outcomes, and second the extent to which FHWA's processes align with these practices.

Several organizations that conduct or oversee scientific and engineering research have identified best practices for those federal agencies that have their own research programs. For example, the Committee on Science, Engineering, and Public Policy and the Of-

Office of Management and Budget establish criteria for federal research programs, focusing on such goals as quality, relevance, performance, and leadership. GAO's research demonstrated that federal agencies have adopted various practices to reach these goals.

We identified two practices that are particularly relevant for FHWA. The first, developing research agendas and consultation with external stakeholders, is related to ensuring the relevance of the research. The second, using a systematic approach to evaluate ongoing and completed research through such techniques as peer review, is related to ensuring the quality of research.

We reported last year that FHWA's processes for developing research agendas do not always fully align with the best practices we identified, including external stakeholder involvement. Stakeholder involvement is important for FHWA, because we expect its research to be used by others, such as state departments of transportation, and manage and conduct—and construct transportation system. FHWA acknowledged at that time that its approach for developing research agendas lacks a consistent transparent and systematic process to ensure that external stakeholders are involved. FHWA responded to our recommendations and similar recommendations from the Transportation Research Board Committee that oversees FHWA. The agency appears to be taking steps we view as necessary to adopt the best practice of involving external stakeholders. FHWA plans to recommend certain action in the forthcoming plan such as inviting external stakeholders to assist FHWA with setting the research and technology program agendas and priorities. Because the plan has not been finalized, I can not yet comment on its potential effectiveness.

We also reported last year that FHWA does not have a systematic process for evaluating research outcomes. Because of the long-term and uncertain nature of research and of its results, evaluating research can be challenging. However, the best practices we identified are meant to address this challenge. At the time of our report, FHWA primarily used a success story approach to evaluate and communicate its research outcomes. While this approach illustrates some benefits of the agency's research, it can not be used as a primary method, because these stories represent only a fraction of the program's research projects. As a result, we concluded that we couldn't be confident that FHWA is selecting research projects that have the highest potential value or that FHWA knows the extent to which these projects have achieved their objectives.

We recommended that FHWA develop a systematic approach to evaluating its research program. I noted peer review as the best practice for doing so. FHWA agreed that the agency must do a better job of measuring the performance of its research and technology program. The agency has taken important steps such as completing a benchmarking study to identify practices at other federal research agencies. In addition, FHWA's new draft plan includes expert review of the agency's research and technology program in the form of merit review panels. These panels would conduct evaluations and reviews on a periodic basis at the program and agency level. However, FHWA is still in the process of actually developing and adopting this framework, therefore, I really can't comment at this time on the results of FHWA's efforts in this area.

Mr. Chairman, this concludes my statement. I am happy to answer questions.

[The prepared statement of Ms. Siggerud follows:]

PREPARED STATEMENT OF KATHERINE SIGGERUD

HIGHWAY RESEARCH

DOT's Actions to Implement Best Management Practices for Setting Research Agendas and Evaluating Outcomes

What GAO Found

Leading organizations, federal agencies, and experts that conduct scientific and engineering research use best practices designed to ensure that research objectives are related to the areas of greatest interest to research users and that research is evaluated according to these objectives. Of the specific best practices recommended by experts—such as the Committee on Science, Engineering, and Public Policy and the National Science Foundation—GAO identified the following practices as particularly relevant for FHWA: (1) developing research agendas in consultation with external stakeholders to identify high-value research and (2) using a systematic approach to evaluate research through such techniques as peer review.

FHWA's processes for developing its research agendas do not always consistently include stakeholder involvement. External stakeholder involvement is important for FHWA because its research is, to be used by others that manage and construct transportation systems. FHWA acknowledges that its approach for developing research agendas lacks a systematic process to ensure that external stakeholders are involved. In response to GAO's recommendation, FHWA has drafted plans that take the necessary steps toward developing a systematic process for involving external stakeholders. While the plans appear responsive to GAO's recommendation, as shown in the table below, GAO cannot evaluate their effectiveness until they are implemented.

FHWA does not have a systematic process that incorporates techniques such as peer review for evaluating research outcomes. Instead, the agency primarily uses a "success story" approach to communicate about those research projects that have positive impacts. As a result, it is unclear the extent to which all research projects have achieved their objectives. FHWA acknowledges that it must do more to measure the performance of its research program, however, it is still in the process of developing a framework for this purpose. While FHWA's initial plans appear responsive to GAO's recommendation, GAO cannot evaluate their effectiveness until they are implemented.

FHWA's Response to GAO's Recommendations		
GAO's Recommendation	Does FHWA have plans that are responsive to the recommendation?	Has FHWA implemented the recommendation?
Develop a systematic approach for obtaining input from external stakeholders in determining the research program's agendas.	●	○
Develop a systematic process for evaluating significant ongoing and completed research that includes peer review or other best practices in use at federal research agencies.	●	○
Develop specific plans for implementing these recommendations, including time frames and estimates of their costs.	◐	◐

Source: GAO.

Note: ● = yes; ◐ = partially; and ○ = no.

Mr. Chairman and Members of the Committee:

We appreciate the opportunity to testify today on the Federal Highway Administration's (FHWA) surface transportation research and technology program. Change, improvement, and innovation based on highway research have long been important to the highway system. While this research is a shared responsibility among FHWA, state departments of transportation, and private organizations, we focused on

FHWA's important leadership role as the primary federal agency involved in highway research. Throughout the past decade, FHWA has received hundreds of millions of dollars for its surface transportation research and technology program, including nearly half of the Department of Transportation's (DOT) approximate \$1 billion budget for research, development, and technology in fiscal year 2002. Given the important expectations of highway research and the significant level of resources dedicated to it, it is important for the Congress and the American people to know that the agency is conducting research that is relevant and useful to stakeholders and that is of high quality. In May 2002 we issued a report on these issues and made recommendations to FHWA, which the agency agreed with, aimed at improving its processes for setting research agendas and evaluating its research efforts.¹ As it considers reauthorizing FHWA's research and technology program, Congress will be making decisions about the structure of the program. Accordingly, my testimony today will discuss (1) best practices for developing research agendas and evaluating research outcomes for federal research programs; (2) the extent to which FHWA's processes for developing research agendas align with the best practices for similar federal research programs; and (3) the extent to which FHWA's processes for evaluating research outcomes align with these best practices.

My statement is based in part on our May 2002 report, which focused primarily on those activities funded by the surface transportation research and technology deployment funding categories identified in the Transportation Equity Act for the 21st Century. In developing that report, we held discussions with FHWA officials and reviewed relevant program documents, legislation, and publications on best practices in federal research from the Transportation Research Board, the Committee on Science, Engineering, and Public Policy and others. In preparing for this hearing, we also updated FHWA's activities in response to our findings and recommendations.

In summary:

- Leading organizations that conduct scientific and engineering research, other federal agencies with research programs, and experts in research and technology have identified and use best practices designed to ensure that research objectives are related to the areas of greatest interest and concern to research users and that research is evaluated according to these objectives. Specific best practices in these areas used in other federal research programs or recommended by experts—such as the Committee on Science, Engineering, and Public Policy,² the Environmental Protection Agency, the National Science Foundation, and the Office of Management and Budget—include: (1) developing research agendas in consultation with external stakeholders to identify high value research and (2) using a systematic approach to evaluate ongoing and completed research through such techniques as peer review.
- As we reported last year, FHWA's processes for developing research agendas for its research and technology program do not always consistently include stakeholder involvement. External stakeholder involvement is important for FHWA because its research is expected to be used by others, such as state departments of transportation, which manage and construct transportation systems. FHWA acknowledges that its approach for developing research agendas lacks a consistent, transparent, and systematic process to ensure that external stakeholders are involved. Instead, the agency expects each program office to determine how or whether to involve external stakeholders in the agenda setting process. As a result, this approach is used inconsistently. To improve its program and in response to our recommendations, FHWA has drafted plans that seem to take the necessary steps toward developing a systematic process for involving external stakeholders in the agenda setting process. FHWA's plans have not been finalized, and we cannot comment on the potential effectiveness of these plans.
- We reported last year that FHWA does not have a systematic process that incorporates techniques such as peer review for evaluating research outcomes. Instead, the agency primarily uses a "success story" approach to evaluate and communicate its research outcomes. While this approach illustrates some ben-

¹*Highway Research: Systematic Selection and Evaluation Processes Needed for Research Program* (GAO-02-573, May 2002).

²Committee on Science, Engineering, and Public Policy, *Evaluating Federal Research Programs: Research and the Government Performance and Results Act* (Washington, DC: Feb. 1999). The Committee on Science, Engineering, and Public Policy is a joint committee of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

efforts of the agency's research, it cannot be used as the primary method to evaluate the outcomes of the research against intended results because these stories represent only a fraction of the program's completed research projects. As a result, it is unclear whether the organization is selecting research projects that have the highest potential value, or the extent to which these projects have achieved their objectives. We recommended that FHWA develop a systematic approach to evaluating its research program, and noted peer review as a best practice for doing so. In response, FHWA agreed that the agency must do a better job to measure the performance of its research and technology program. However, currently it is still in the process of developing, defining, and adopting a framework for measuring performance. Therefore, we cannot yet comment on FHWA's efforts to evaluate research outcomes.

Background

FHWA is the DOT agency responsible for federal highway programs—including distributing billions of dollars in federal highway funds to the states—and developing federal policy regarding the Nation's highways. The agency provides technical assistance to improve the quality of the transportation network, conducts transportation research, and disseminates research results throughout the country. FHWA's program offices conduct these activities through its Research and Technology Program, which includes "research" (conducting research activities), "development" (developing practical applications or prototypes of research findings), and "technology" (communicating research and development knowledge and products to users). FHWA maintains a highway research facility in McLean, Virginia. This facility, known as the Turner-Fairbank Highway Research Center, has over 24 indoor and outdoor laboratories and support facilities. Approximately 300 federal employees, on-site contract employees, and students are currently engaged in transportation research at the center.

FHWA's research and technology program is based on the research and technology needs of each of its program offices such as the Offices of Infrastructure, Safety, or Policy. Each of the program offices is responsible for identifying research needs, formulating strategies to address transportation problems, and setting goals for research and technology activities that support the agency's strategic goals. (See Appendix I for examples of research that these offices undertake.) One program office that is located at FHWA's research facility provides support for administering the overall program and conducts some of the research. The agency's leadership team, consisting of the associate administrators of the program offices and other FHWA offices, provides periodic oversight of the overall program. In 2002 FHWA appointed the Director of its Office of Research, Development, and Technology as the focal point for achieving the agency's national performance objective of increasing the effectiveness of all FHWA program offices, as well as its partners and stakeholders, in determining research priorities and deploying technologies and innovation.

In addition to the research activities within FHWA, the agency collaborates with other DOT agencies to conduct research and technology activities. For example, FHWA works with DOT's Research and Special Programs Administration to coordinate efforts to support key research identified in the department's strategic plan.³ Other nonfederal research and technology organizations also conduct research funded by FHWA related to highways and bridges. Among these are state research and technology programs that address technical questions associated with the planning, design, construction, rehabilitation, and maintenance of highways. In addition, the National Cooperative Highway Research Program conducts research on acute problems related to highway planning, design, construction, operation, and maintenance that are common to most states. Private organizations, including companies that design and construct highways and supply highway-related products, national associations of industry components, and engineering associations active in construction and highway transportation, also conduct or sponsor individual programs. Universities receive funding for research on surface transportation from FHWA, the states, and the private sector.

³As required by the Transportation Equity Act for the 21st Century, DOT annually develops the department wide "Research, Development, and Technology Plan." This plan, drafted by the Research and Special Programs Administration and funded in part by FHWA, provides program-level detail on the directions that DOT's research will take. This plan is used by the individual operating administrations, such as FHWA and the Research and Special Programs Administration, as a resource document to develop their subsequent program proposals for inclusion in their administration budgets.

Research Community Promotes Use of Best Practices for Developing Research Agendas and Evaluating Research Outcomes

Leading organizations that conduct scientific and engineering research, other federal agencies with research programs, and experts in research and technology have identified and use best practices for developing research agendas and evaluating research outcomes. Although the uncertain nature of research outcomes over time makes it difficult to set specific, measurable program goals and evaluate results, the best practices we identified are designed to ensure that the research objectives are related to the areas of greatest interest and concern to research users and that research is evaluated according to these objectives. These practices include (1) developing research agendas through the involvement of external stakeholders and (2) evaluation of research using techniques such as expert review of the quality of research outcomes.

Developing Research Agendas Through the Involvement of External Stakeholders

External stakeholder involvement is particularly important for FHWA because its research is expected to improve the construction, safety and operation of transportation systems that are primarily managed by others, such as state departments of transportation. According to the Transportation Research Board's Research and Technology Coordinating Committee,⁴ research has to be closely connected to its stakeholders to help ensure relevance and program support, and stakeholders are more likely to promote the use of research results if they are involved in the research process from the start.⁵ The committee also identified merit review of research proposals by independent technical experts based on technical criteria as being necessary to help ensure the most effective use of federal research funds. In 1999, we reported that other federal science agencies—such as the Environmental Protection Agency and the National Science Foundation—used such reviews to varying degrees to assess the merits of competitive and noncompetitive research proposals.⁶ In April 2002, the Office of Management and Budget issued investment criteria for federal research and technology program budgets that urge these agencies to put into place processes to assure the relevance, quality and performance of their programs. For example, the guidance requires these programs to have agendas that are assessed prospectively and retrospectively through external review to ensure that funds are being expended on quality research efforts.

Evaluation of Research

The Committee on Science, Engineering, and Public Policy reported in 1999 that federal agencies that support research in science and engineering have been challenged to find the most useful and effective ways to evaluate the performance and results of the research programs they support. Nevertheless, the committee found that research programs, no matter what their character and goals, can be evaluated meaningfully on a regular basis and in accordance with the Government Performance and Results Act. Similarly, in April 2002 the Office of Management and Budget issued investment criteria for federal research and technology program budgets that require these programs to define appropriate outcome measures and milestones that can be used to track progress toward goals and assess whether funding should be enhanced or redirected. In addition, program quality should be assessed periodically in relation to these criteria through retrospective expert review. The Committee on Science, Engineering, and Public Policy also emphasized that the evaluation methods must match the type of research and its objectives, and it concluded that expert or peer review is a particularly effective means to evaluate federally funded research.

Peer review is a process that includes an independent assessment of the technical and scientific merit or quality of research by peers with essential subject area expertise and perspective equal to that of the researchers. Peer review does not require that the final impact of the research be known. In 1999, we reported that federal

⁴The Research and Technology Coordinating Committee was convened in 1991 by the Transportation Research Board of the National Academies to provide a continuing, independent assessment of FHWA's research and technology program. FHWA provides funding for the committee.

⁵Transportation Research Board, *The Federal Role in Highway Research and Technology* (Washington, D.C.: National Academy Press, 2001), p. 76. For surface transportation research, potential stakeholders include state and local highway agencies that own and operate the Nation's highways; highway users; the companies that furnish the products, services, and equipment needed to build, operate, and maintain the highway system; and the people and communities that benefit from and are affected by the system.

⁶*Federal Research: Peer Review Practices at Federal Science Agencies Vary* (GAO/RCED-99-99, Mar. 1999), p. 2.

agencies, such as the Department of Agriculture, the National Institutes of Health, and the Department of Energy, use peer review to help them (1) determine whether to continue or renew research projects, (2) evaluate the results of research prior to publication of those results, and (3) evaluate the performance of programs and scientists.⁷ In its 1999 report, the Committee on Science, Engineering, and Public Policy also stated that expert review is widely used to evaluate: (1) the quality of current research as compared with other work being conducted in the field, (2) the relevance of research to the agency's goals and mission, and (3) whether the research is at the "cutting edge."

External Stakeholders' Involvement in Developing FHWA's Research Agendas Has Been Limited

Although FHWA engages external stakeholders in elements of its research and technology program, the agency currently does not follow the best practice of engaging external stakeholders on a consistent and transparent basis in setting its research agendas. The agency expects each program office to determine how or whether to involve external stakeholders in the agenda setting process. As we reported in May 2002, FHWA acknowledges that its approach to preparing research agendas is inconsistent and that the associate administrators of FHWA's program offices primarily use input from the agency's program offices, resource centers, and division offices.⁸ Although agency officials told us that resource center and division office staff provide the associate administrators with input based on their interactions with external stakeholders, to the extent that external stakeholder input into developing research agendas occurs, it is usually ad hoc and provided through technical committees and professional societies. For example, the agency's agenda for environmental research was developed with input from both internal sources (including DOT's and FHWA's strategic plans and staff) and external sources (including the Transportation Research Board's reports on environmental research needs and clean air, environmental justice leaders, planners, civil rights advocates, and legal experts).

In our May 2002 report we recommended that FHWA develop a systematic approach for obtaining input from external stakeholders in determining its research and technology program's agendas. FHWA concurred with our recommendation and has taken steps to develop such an approach. FHWA formed a planning group consisting of internal stakeholders as well as representatives from the Research and Special Programs Administration and the Pennsylvania Department of Transportation to determine how to implement our recommendation. This planning group prepared a report analyzing the approaches that four other federal agencies are taking to involve external stakeholders in setting their research and technology program agendas. Using the lessons learned from reviewing these other agencies' activities, FHWA has drafted a Corporate Master Plan for Research and Deployment of Technology & Innovation. Under the draft plan, the agency would be required to establish specific steps for including external stakeholders in the agenda setting process for all areas of research throughout the agency's research and technology program by fiscal year 2004. In drafting this plan, FHWA officials obtained input from internal stakeholders as well as external stakeholders, including state departments of transportation, academia, consultants, and members of the Transportation Research Board. It appears that FHWA has committed to taking the necessary steps to adopt the best practice of developing a systematic process for involving external stakeholders in the agenda setting process. The draft plan invites external stakeholders to assist FHWA with such activities as providing focus and direction to the research and technology program and setting the program's agendas and priorities. However, because FHWA's plan has not been finalized, we cannot comment on its potential effectiveness in involving external stakeholders.

FHWA Lacks a Systematic Approach to Evaluating Research Outcomes

As we reported last year, FHWA does not have an agency wide systematic process to evaluate whether its research projects are achieving intended results that uses such techniques as peer review. Although the agency's program offices may use methods such as obtaining feedback from customers and evaluating outputs or outcomes versus milestones, they all use success stories as the primary method to evaluate and communicate research outcomes. According to agency officials, success stories are examples of research results adopted or implemented by such stakeholders as state departments of transportation. These officials told us that success

⁷ GAO/RCED-99-99.

⁸ FHWA has four resource centers throughout the country, and division offices in each state, Puerto Rico and District of Columbia.

stories can document the financial returns on investment and non-monetary benefits of research and technology efforts. However, we raised concerns that success stories are selective and do not cover the breadth of FHWA's research and technology program.

In 2001, the Transportation Research Board's Research and Technology Coordinating Committee concluded that peer or expert review is an appropriate way to evaluate FHWA's surface transportation research and technology program. Therefore, the committee recommended a variety of actions, including a systematic evaluation of outcomes by panels of external stakeholders and technical experts to help ensure the maximum return on investment in research. Agency officials told us that increased stakeholder involvement and peer review will require significant additional expenditures for the program. However, a Transportation Research Board official told us that the cost of obtaining expert assistance could be relatively low because the time needed to provide input would be minimal and could be provided by such inexpensive methods as electronic mail.

In our May 2002 report, we recommended that FHWA develop a systematic process for evaluating significant ongoing and completed research that incorporates peer review or other best practices in use at federal agencies that conduct research.⁹ While FHWA has concurred that the agency must measure the performance of its research and technology program, it has not developed, defined or adopted a framework for measuring performance. FHWA's report on efforts of other federal agencies that conduct research, discussed above, analyzed the approaches that four other federal agencies are taking to evaluate their research and technology programs using these best practices. According to FHWA's assistant director for Research, Technology, and Innovation Deployment, the agency is using the results of this report to develop its own systematic approach for evaluating its research and technology program. However, this official noted that FHWA has been challenged to find the most useful and effective ways to evaluate the performance and results of the agency's research and technology program. According to FHWA's draft Corporate Master Plan for Research and Deployment of Technology & Innovation, FHWA is committed to developing a systematic method of evaluating its research and technology program that includes the use of a merit review panel. This panel would conduct evaluations and reviews in collaboration with representatives from FHWA staff, technical experts, peers, special interest groups, senior management, and contracting officers. According to the draft plan, these merit reviews would be conducted on a periodic basis for program-level and agency-level evaluations, while merit reviews at the project level would depend on the project's size and complexity. FHWA is still in the process of developing, defining, and adopting a framework for measuring performance. Therefore, we cannot yet comment on how well FHWA's efforts to evaluate research outcomes will follow established best practices.

Mr. Chairman, this concludes my prepared statement. I would be pleased to answer any questions that you or Members of the Committee may have.

Contacts and Acknowledgments

For further information on this testimony, please contact Katherine Siggerud at (202) 512-2834 or siggerudk@gao.gov. Deena Richart made key contributions to this testimony.

⁹ GAO-02-573.

Appendix I: Roles of Program Offices in FHWA's Research and Technology Program

FHWA's research and technology program is based on the research and technology needs of each of its program offices such as the Offices of Infrastructure, Safety, and Policy. Each of the program offices is responsible for identifying research needs, formulating strategies to address transportation problems, and setting goals for research and technology activities that support the agency's strategic goals. (See table 1.)

Table 1: Roles of Program Offices in Research and Technology

Program office name	Role in research and technology	Examples of research and technology projects
Federal Lands Highway	Development of applied research and technology applicable to transportation systems serving federal lands.	Road Surface Analyzer (ROSAN) measurement of pavement smoothness.
Infrastructure	Development of research and technology in the areas of highway construction and physical maintenance, pavements, and structures.	Long-term pavement performance. Concrete research and technology. Innovative bridge technology.
Operations	Development of research and technology program plans for the Intelligent Transportation Systems program, as well as operation of the transportation system and management of freight transportation.	Research into advanced traffic simulation modeling. Prediction tools and research into advanced, adaptive traffic signal control strategies. Analysis of critical intermodal freight corridors and facilities.
Planning and Environment	Development of research and technology in the areas of planning, environment, and property acquisition.	Work zone best practices guide and program support. Workshops, synthesis materials, and case studies of state consultation practices with rural officials. Statewide planning and travel forecasting training. Research on the contribution of transportation to air pollution and on strategies to reduce transportation effects.
Policy	Development of analytical tools and data systems for policy development and studies; conducting analysis and studies to support the formulation of transportation policy and legislative initiatives; and preparation of major reports to Congress on highway policy issues.	Highway noise barrier design handbook. National personal transportation survey. Highway cost allocation study. Production of biennial report, "Status of the Nation's Highways, Bridges, and Transit: Condition and Performance."
Safety	Leading in development of research and technology activities in the areas of Intersections; Pedestrian and Bicyclist Safety; Roadside Safety; Run-Off-Road Safety; and Speed Management.	Interactive highway safety design model for two-lane roads. Pedestrian safety countermeasure selection system.

Program office name	Role in research and technology	Examples of research and technology projects
		Education and community programs for pedestrian/bicyclist safety. Analysis of intersection safety issues. Red-light running prevention. Speed limit setting and enforcement. Variable speed limits.
Research, Development, and Technology	Support of all other business units in the development and delivery of new technologies.	Research activities to support Infrastructure, Operations, and Safety units.

Source: GAO's presentation of information provided by FHWA.

Chairman EHLERS. Thank you. Ms. Canby.

**STATEMENT OF MS. ANNE P. CANBY, PRESIDENT, SURFACE
TRANSPORTATION POLICY PROJECT**

Ms. CANBY. Good morning, Mr. Chairman. As you said, I am Anne Canby, President of the Surface Transportation Policy Project. I am very pleased to be here this morning with my distinguished panel.

Let me focus on just a few of the points in my written testimony. One of the challenges I believe we face is to adjust our research efforts to help us deliver what the public wants, more trip choice, a balanced investment in our transportation system, greater responsiveness to community, public health, and environmental concerns. And the challenge in the research arena is to define an agenda that responds to these public needs.

Shaping our transportation agenda can help position us better to respond to the needs of the public. Let me cite a few examples from my written testimony. The basic principles and policies, as set forth in ISTEA, intermodalism, economic efficiency, environmental quality and equity, as well as the planning factors set forth in the statewide and metropolitan planning sections of the law should guide and develop the prioritization of our research agenda as well as be used to set performance measures that would enable us to track the progress on achieving the goals of the law. To help you and the Congress follow this progress, having the Transportation Secretary report annually to you would enable us to all understand the progress or not that is being made.

Let me focus on a few of the particular needs that we envision. There is a need to close the information and data deficit that now exists. This is a report prepared by the BTS that speaks to the deficit in the pedestrian and bicycle data alone, examining the needs of all users, all modes, and all types of trips, expanding our knowledge on key issues that matter to the public in the areas of social equity, community development, growth management, public health, and the environment. And third, looking at the key trends that, I think, will have huge impact on the transportation system as well.

The aging of our population. By 2025, almost 25—20 percent of our population will be over 65 and the cohort 85 and over is the fastest growing segment of our population. As we all can witness everyday, our aviation and rail systems for intercity travel are threatened, and that is probably a kind word, and we need to better understand how these systems can work together. Household transportation costs now average about 20 percent of family budgets. Understanding the impact of that is also important.

The data deficit can hurt not only the system and people, but can effect the Congress as well, as we all witnessed in the RABA situation that took almost a year to dig out of. And it was due, basically, to inadequate data or assumptions that were being made that created that problem. To overcome the data challenge that we face, some ideas: improving the data quality and data standards, as my colleagues suggested; investing in the Bureau of Transportation Statistics so that it really becomes an equivalent to the Bureau of Labor Statistics or the Bureau of Economic Analysis.

Further, some thoughts on focusing the research agenda on the transportation system, all parts of it. Over 25 percent of all trips are less than one mile, and they tend not to even be captured in the transportation forecast models that we use, so we have very little understanding of these trips, or nowhere near as much as we need to.

Clearly, the interdependence of the transportation modes was one of the major lessons we learned as a result of 9/11 when Amtrak was truly a lifeline to the city of New York. The importance and functioning of an intermodal, integrated, multi-modal system was made very clear in the aftermath of that event.

Support for the Environmental Cooperative Research Program that you all created in TEA-21 now needs to be funded so that we may more effectively address the social equity, community development, growth, public health, and environment issues. Expanding the stakeholders, as my colleagues have mentioned, so that we really include the research experts from other fields. The complexity of the metropolitan areas, I think, requires that we examine the potential of creating a metropolitan planning and research program that would parallel to the state planning and research program that exists today.

Finally, focusing on outcomes, we need to be able to determine and articulate if we are making progress or falling short. We spend an enormous amount of money, and more robust data and research are key to measuring our performance.

Let me conclude by underscoring your importance in this work and that we are ready to—here to help you study the right issues, collect the right data, close the gaps, and commit our support to helping you do that.

Thank you, Mr. Chairman.

[The prepared statement of Ms. Canby follows:]

PREPARED STATEMENT OF ANNE P. CANBY

Mr. Chairman, I am Anne Canby, President of the Surface Transportation Policy Project. I have served as a state transportation secretary in Delaware and New Jersey and currently I am serving on a volunteer basis as the Chair of the Technical Activities Council of the Transportation Research Board.

The Surface Transportation Policy Project or STPP is a nationwide network of more than 600 hundred organizations working to promote transportation policies and options for everyone, conserve energy, protect the environmental and aesthetic quality of neighborhoods, promote access to those now under served, particularly seniors and persons with disabilities, and strengthen the economy.

The STPP coalition has been a key driver for transportation policy reform since its inception in 1990, seeking the implementation of reforms that were made part of ISTEA and reaffirmed in TEA-21.

Mr. Chairman and the Members of this subcommittee, I am pleased to share our views on "Transportation Research and Development: Investing in the Future."

Overview of Key Issues and Recommendations

Mr. Chairman, one of the challenges before us is how we structure the federal research program to respond to what the public wants. Current research efforts focus too much on vehicles, rather than the people who use the system, and on facilities that serve vehicles, rather than people and businesses in their communities.

The real challenge before us is to set a research agenda that responds to the public and their diverse needs and interests. In survey after survey, we see a public that wants more choices, more balanced investments, and more responsiveness to community, public health and environmental concerns. Clearly, we must find ways to respond to these expectations if we hope to find the resources to maintain and expand our transportation systems. We believe that part of the answer to unlocking this public support is to do what the public wants. This means building the capacity

to engage them on what they care about. The federal research agenda is a big part of this equation.

We can move in this direction by adhering more closely to the basic principles and policies of ISTEA and TEA-21—intermodalism, economic efficiency, environmental quality and equity—and by looking to the law’s planning factors set forth in Sections 134 and 135. It is our view that we should calibrate our research agenda to these basic goals and factors. Each of the major research elements, including the proposed F-SHRP agenda, should be measured against this standard. This could be accomplished by simply directing the Transportation Secretary to report annually to the Congress, describing how federal research investments address these goals and factors.

This overarching context for our federal research program will help deliver timely and complete information to support the many decisions affecting the allocation of billions of transportation dollars now provided to the states and local areas.

Within this context, we can respond more directly to the public by focusing our research agenda on efforts that—

- Close the information and data deficit, allowing us to manage our systems more efficiently because we have the data,
- Look out for the needs of all users and modes, helping us move beyond simply vehicles and on to overall system needs,
- Expand our knowledge on questions that are squarely before the public, such as equity, community development and growth, public health and the environment, and
- Tackle overlooked issues and trends, such as how transportation costs affect families or how we can improve access for seniors and persons with disabilities.

Mr. Chairman, I want to speak first to the data deficit that now exists. This real limiting factor undermines our ability to make smarter transportation investments. This is a serious matter, but there are some ways we can make progress.

- Make a stronger commitment to data quality and data standards, recognizing that data deficiencies can distort decisions and unduly influence policy debates throughout the system,
- Invest in the Bureau of Transportation Statistics to make it a stronger and more independent source of transportation data, modeling it after the Bureau of Labor Statistics, and
- Reform current practices to ensure that we are getting the data we need when we need it. Some examples of recent challenges include: data failures that led to the “RABA” funding problem that tied up Congress for more than one year; the lack of “real time” data on intercity travel to tell decision-makers what is going on in the system and to help them respond to changing conditions; better data on goods movement and other issues to help address transportation security concerns in a post 9/11 world; and better data on the nexus between transportation and air quality, particularly now as we move to implement the 8-hour ozone standard.

Another pathway to serving the public is to recognize the need for more balance among the modes and balancing the use of modes—

- Adjust the research agenda to focus data and research on the broader transportation system, rather than individual modes of travel, to help transportation decision-makers address integration and interconnectivity needs, a shift that responds directly to public notions about travel and trip-making (the public does not worry about the funding silos),
- Value the lessons of 9/11, including the realignment of our intercity rail, aviation and highway travel networks that is now occurring, by directing resources to gather new information and data on intercity passenger travel and options for adapting to changing travel patterns and preferences, and
- Recognize that current data gaps continue to undermine efforts to deliver more choice and balance within regions and local areas, with our coalition calling particular attention to inadequate data on pedestrians, bicyclists, older Americans and children and on trips of one mile or less (which now account for more than one out of every four trips as contrasted to “commute” trips which are now fewer than one out of every six trips).

Mr. Chairman, getting the data right also means we can undertake the research, both applied and R&D, that will help us respond more directly to what the public

is concerned about. I noted earlier some of the key issues before citizens in their communities—equity, community development and growth, public health and the environment.

One of the questions before this committee is funding for the Surface Transportation Environmental Cooperative Research Program, which we see as an important plank in the effort to realign the federal research agenda with the public's concerns. This is a priority for STPP. We were disappointed that this TEA-21 initiative was not funded at any time during the six-year authorization cycle.

In our recommendations on TEA-21 renewal, called "Stay the Course," the STPP coalition calls for STECRP funding of at least \$15 million in the first year of the new bill, rising to \$28 million by the end of the renewal period. We offer the idea that this be done as a take down on overall funding, as we now provide for the NCHRP.

STECRP is a good example of how we can advance the goals of the law, while moving the federal research agenda in a direction that also satisfies key public concerns. And, we know we have a lot of work to do to assure the public that transportation decision-makers are attuned to their environmental and public health concerns.

Let me elaborate further on this point. There is no question about the effects of poor air quality on human health, and the public knows this as well. What we lack is a funding stream that delivers the research and data to help us more fully understand how to make the right transportation investments for better air quality.

Mr. Chairman, we also see this initiative as a pathway for tackling many environmental challenges. We lack the performance measures and tools to monitor how our transportation investments affect the environment. We know that land use plans and development patterns can reduce our reliance on automobile trips and improve environmental quality, but we need more research and information to help us do this more effectively. We know that protecting biodiversity and habitat is a challenge for transportation officials so additional research in this area will help better inform their decisions. There are environmental and social justice issues where additional research and study will help us respond to these needs. All of these questions resonate with voters, and enhanced efforts here will position decision-makers to engage the public on these issues.

I should note the recent TRB report on STECRP, which did an excellent job of setting forth an agenda for this program, as required under TEA-21. It provides a framework for delivering the knowledge to support more informed decisions on these and other matters.

Mr. Chairman, we also need to engage the public more directly and work to deepen our understanding of what is going on in communities and what needs to be done. Among some of the steps that would make a difference—

- Rethink how our research processes involve stakeholders, moving to broaden the perspective of transportation experts by embracing the many new players and organizations, such as the public health community, housing, social equity, smart growth and business and user groups that want to become more engaged in the debate on transportation investment and outcomes, and
- Support the incorporation of new technologies and tools—computer-assisted planning and simulations, modeling enhancements, GIS coding of project and financial data, Internet-based reporting and other transparency techniques—that open up the decision-making processes, bringing the public more fully into the debate on transportation investment decisions.

Another key area is how the federal research program can accelerate our efforts to measure the outcomes of transportation investments, to know if we are making progress or falling short. This area is very much on the minds of the public as taxpayers. After all, we are talking about more than \$40 billion in annual spending.

Improved data efforts and a more balanced research program that is focused on the Act's goals and planning requirements are an important step in moving toward more performance and improved methods for measuring outcomes. I applaud the Administration's emphasis on performance measurement and performance management, which helps to set the tone for our discussions on the research agenda.

We would suggest that this committee look at placing more emphasis on local and metropolitan needs through the establishment of a Metropolitan Planning and Research program (MPR), as we now do for state transportation departments under the State Planning and Research program (SPR).

I would note that most states are only responsible for a portion of the transportation system, usually state-owned roads and often-larger highways at that. This misses many parts of the transportation system and tends to narrow our inquiry

on many issues. Resources to support further research at the regional and metropolitan level are crucial to our efforts to make further strides on many fronts, particularly performance measurement. It is at the regional and local level where most transportation assets are managed. Decision-making and investments occur at a scale where outcomes can be more readily measured.

Another opportunity to further performance measurement is to build on the General Accounting Standards Board rule, known as GASB-34, which has set in motion a fundamental reform in how state and local governments account for their assets, including transportation facilities. These rules, for the first time, will place all states and other governmental units on a path to standardized reporting, specifically "life cycle accounting," to ensure that agencies are adequately investing resources to maintain their transportation infrastructure. GASB-34 will increase the transparency of transportation funding decisions, holding agencies more accountable for system preservation and maintenance needs, reinforcing key principles and program features set forth in ISTEA and TEA-21. In addition, state and metropolitan plans, for example, are required to consider life cycle costing. FHWA and FTA should be looking to take full advantage of the new outputs from these rules. The research title should provide research funds and other resources to ensure that FHWA and FTA are ready to synchronize their work on performance measurement with the new information GASB-34 will provide.

Another opportunity to improve performance accounting is to examine how the financial data tracking system managed by the Federal Highway Administration, known as the FMIS system, could be adjusted to help monitor performance and measure program outcomes. Currently, the FMIS system concentrates on tracking unobligated balances, with states inputting data on project type, obligations by program category, unobligated balances and more than 350 other parameters. This system, with some modest adjustments, could help us better measure outcomes and deliver better information to the public. We believe that the FMIS system could also be a new resource in helping us better understand project delivery issues, including better data on the status of environmental reviews.

Conclusion

Mr. Chairman, I want to conclude my comments by underscoring the powerful influence that U.S. DOT-sponsored and other federally-assisted research exerts on choices and policies at the state and local level and even here in Washington on the substantive debate on surface transportation. The Federal Government is the dominant investor in transportation research. As such, it is all the more important that federal research efforts consider the right issues and develop the right data, to ensure balance.

STPP believes that the Federal Government must exert greater leadership in the research area, starting with specific initiatives that address critical knowledge gaps, ensure better data quality and integrity, promote more balance and intermodalism, focus on system needs rather than simply modal users and their concerns, and emphasize the needs of users and customers of the system.

I mentioned some of the many critical gaps that now exist in our current research efforts. Again, I want to underscore some of the data challenges we confront on intercity travel. Here the information gaps are so pronounced that one of STPP's partners, "Reconnecting America," is leading an effort to examine these relationships among the modes to get a better picture of what is happening to our intercity travel systems, recognizing that all three major transportation bills—surface transportation, aviation and intercity rail—are up for renewal this year. The key point here is that so much of our current research agenda is driven by modal concerns that we overlook obvious linkages and interconnections among the modes, such as the serious instability of our intercity travel networks.

Mr. Chairman, I wanted to offer some final comments on our level of effort, which is to say our funding commitments to the research agenda. Clearly, we need to do more, because the stakes are high. Currently, we are investing about \$500 million annually for these purposes, slightly more than one percent of federal spending on surface transportation under TEA-21. This commitment is roughly .3 percent of all government spending on surface transportation and about .03 percent of all public and private transportation expenditures. Placing this issue in the context of the public, each American family is now spending nearly 20 percent of their household budget on transportation costs, more than double the share of the early 60s. Simply put, federal research investment help drive billions of dollars in expenditures and about one out of every five dollars each American family spends.

All of this is to urge this committee to provide adequate resources for transportation research in the TEA-21 renewal, resources that are critically important to the Nation's transportation efforts and other broader economic and societal issues.

Compared to other federal agencies and investments by the private sector, it is clear that we are under-investing in transportation research and data. We have the opportunity to remedy this imbalance during renewal of TEA-21.

On behalf of STPP and its many coalition partners, thank you for this opportunity to appear before you today and we stand ready to support this committee's efforts as you move forward with legislation in this area.

Chairman EHLERS. Thank you. Dr. Meyer.

STATEMENT OF DR. MICHAEL D. MEYER, PROFESSOR, GEORGIA INSTITUTE OF TECHNOLOGY, SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

Dr. MEYER. Mr. Chairman, my name is Michael Meyer. I am a professor of Civil and Environmental Engineering at the Georgia Institute of Technology. And over the past 25 years, I have conducted research on many of the important economic, social, and demographic factors and trends that have affected our nation's transportation system. From 1983 to 1988, I was also Director of the Transportation Planning and Development Bureau for the Commonwealth of Massachusetts and saw firsthand how such factors influence the effectiveness of our transportation plans and programs in dealing with the tremendous mobility challenges facing a growing economy while meeting important environmental and social goals.

My purpose today is to highlight the need for research that examines these types of factors because a systematic research effort in dealing with the consequences to transportation of social, demographic, and economic trends, as is being proposed by my colleagues for other targeted topics, does not currently exist. Such questions that have often not been addressed very seriously from the perspective of what impact they have on the performance of the transportation system and most importantly have not been examined from the perspective of how changes in the future will affect this performance. This is the strategic nature of our research program that I will be discussing today.

Let me first focus on some of the major trends that affect transportation performance. My written testimony provides much more detail. I will just simply summarize. Given the significant relationship between economic activity and the transportation system performance, the changing economic context of transportation systems is an area where significant thought should be given to how changes in the economy in production processes and then logistics will affect our nation's transportation systems. Some of the important trends and factors include the evolution of metropolitan areas as economic units. Many years ago, when one talked about urban areas, we were talking about cities. Today, we talk about metropolitan areas. Metropolitan areas are really the basic unit of analysis now with regard to our nation's economy and the transportation system supportive of metropolitan areas is critical.

Globalization, certainly I am not the first one to notice globalization as an important trend. But I had a unique experience the past two years in participating in the U.S. DOT's international scanning programs where I visited Europe and Latin American to see how the Europeans and Latin Americans are preparing for some of the future trade that they are expecting. If even half of what is being—is predicted comes true, our nation's ports and the

transportation systems that serve them will be certainly very much strained to handle the expected trade. Areas in terms of increasing efficiencies in production and logistics and in information technology based economy and the implications of all of those to transportation are serious areas that I think fall into the economic category.

Some of the demographic and social trends that I think are important that we need to look at more seriously are the increase in population growth. According to the U.S. Census, the U.S. population is expected to grow to about 338 million by the year 2025 and to reach over 400 million by 2050. With our existing transportation system demanding more resources to maintain what we already have put in place, the Nation will have to think carefully and significantly on how this growth is to be accommodated.

The composition of the population, interestingly large portions of the expected growth in population will come from what we are considering today as minority groups. Population trends suggest that many of our urban and rural areas will have large bi- and multi-lingual ethnic groups more than they are—than are found today. Many transportation planners in Atlanta, for example, have been surprised by the results of a 2000 census, which showed significant increases in minority populations in the suburban counties of the region. The implication is to transportation of this important demographic trend range from how transportation services will be provided for those population groups to the methods of disseminating information on the availability of these services.

Aging. Just as the 1950's and 1960's saw the beginning of the Baby Boom generation, the decades of 2000 and 2010 will see its retirement. I suspect that there will be no more important demographic trend over the next 30 to 40 years that will have greater influence on our society than the aging of America. This could have very important implications on how travel information is disseminated, the importance of non-work trips as they relate to daily travel, the provision of transportation services to the elderly population, and even how we design our transportation facilities. The aging in the suburban areas, the low-income population, and rural populations also are very important trends.

The question then becomes: well, who should be responsible for such research? U.S. DOT, the National Research Council, primarily the Transportation Research Board, National Science Foundation state DOT's non-governmental organizations provide an important starting point. However, I think we need to ask ourselves what would this research really try to be accomplishing and what are the characteristics of such a program? I have defined six criteria that I think are important for a program that I have suggested. One, the research should be well founded in any body of science and knowledge that is appropriate for addressing these questions, thus the organizing entity should have the ability to convene researchers with a variety of backgrounds. Two, although not absolutely critical for success, the organizing entity should have some familiarity with transportation research and with the basic relationships between transportation system performance and the economic, demographic, and social factors that influence. Three, the program should provide a rigorous peer review process of research proposals

and research results, and the organizing entity should be credible in the eyes of both the research community as well as the policy-makers. The organizing entity should have a position of impartiality. And finally, the organizing entity should have an established means of disseminating the results of the research. These criteria lead me to the recommendation that, in fact, a program, as I have suggested, be established within the Transportation Research Board given that I believe that they are the most appropriate entity and organization to do what is—what I have suggested.

The final area, quickly, that I have been asked to comment on is the issue of transportation system performance. And in my written testimony, I have recommended that, in fact, the Bureau of Transportation Statistics look very carefully at the goals established in ISTEA and TEA-21 and to identify measures that are most appropriate for determining the effectiveness of the legislation.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Meyer follows:]

PREPARED STATEMENT OF MICHAEL D. MEYER

Mr. Chairman, my name is Michael D. Meyer. I am currently a professor of civil engineering at the Georgia Institute of Technology, and have over the past 25 years conducted research on many of the important economic, demographic, and social trends that affect the performance of our nation's transportation system. From 1983 to 1988, I was Director of Transportation Planning and Development for the Commonwealth of Massachusetts, and saw firsthand how such factors influenced the effectiveness of our transportation plans and programs in dealing with the tremendous mobility challenges of a growing economy while meeting important environmental and social goals.

I join with my colleagues today in supporting the need for programmatic research in transportation that will so greatly foster future growth and productivity in this critical sector of our economy. I have no doubt that the proposed strategic programs on highway and environmental research are critical for furthering the national goal of providing an efficient, effective and environmentally-sensitive transportation system. However, the term "strategic" implies to me a focus on the "big picture," taking a step back from the important processes, procedures and tasks that are so important for developing the transportation system, and asking ourselves what are the critical factors that make our transportation system successful (or not)? What are the trends and societal pressures that the transportation system will be expected to meet, and that might not yet be included in our current thinking? How do we know if the transportation system is performing as desired, and importantly, how can such information be incorporated into national, state and local decision-making?

My purpose today is to highlight the need for research that examines these types of questions, because a *systematic* research effort in dealing with such critical issues, as is being proposed by my colleagues for other targeted topics, does not currently exist. The types of issues that I will be discussing today are not offered to the Committee as some grand revelation. Researchers and scholars have been looking at some of these questions for some time. However, I am suggesting that such questions have often not been addressed very seriously from the perspective of what impact they have on the performance of the transportation system, and most importantly, have not been examined from the perspective of how changes in the future will affect this performance. This is the strategic nature of a research program that I will be discussing today.

Let me first focus on the major trends that affect the performance of the Nation's transportation system. Every student of transportation is taught that transportation is a derived demand, that is, that people and goods don't make a trip for the pure pleasure of travel, but instead do so because of the activities that occur at the destination. These might include work, shopping, school, recreation, personal business, etc. Changes in where such activities occur, who will need to reach such destinations and for what purpose, and traveler knowledge about the ability of the transportation system to meet their needs will clearly have great influence on travel pat-

terns, and thus demands on the transportation system. Also part of this construct is a need to understand how such trips occur, when they are made, and the means used. Many years of research have shown that the price, expected travel time, trip reliability, and the availability of different travel modes greatly influence the trip decisions of individuals and firms. These fundamental relationships thus give rise to the questions of what economic, demographic, and social factors could significantly influence the different characteristics of travel and thus of transportation system performance? And importantly what research could be undertaken to better understand this influence?

Economic: To a first approximation, the change in our nation's gross domestic product (GDP) tracks closely with the level of transportation use, for both passenger and freight. State and metropolitan transportation planners are aware of this relationship, and it is thus not unusual for many planning efforts to start with an economic forecast of a state's or region's economic future. The relationship between economic activity and transportation system performance is thus one that is well accepted in the transportation profession. However, whereas population and demographic trends can be tracked and extrapolated to the future (today's young are tomorrow's elderly), predicting future economic conditions and characteristics is more problematic. Relating such predictions to transportation needs and desired transportation performance is more difficult still. And yet, given the significant relationship between economic activity and transportation system performance, this is an area where significant thought should be given to how changes in the economy, in production processes, and in logistics will affect our nation's transportation system.

My experience in transportation planning and policy over the past 25 years suggests to me that transportation officials are often "surprised" by unexpected characteristics of the production process and, most importantly, by what is expected from the transportation system. For example, it took some years for many transportation officials to recognize the "just-in-time" production revolution in manufacturing. Such a production process is strongly dependent on a reliable delivery system, often with production parts originating in different parts of the world. Reliability and intermodal efficiency thus become critical characteristics of a transportation system that can support a production process based on just-in-time deliveries.

The following are just some of the economic factors and trends that will have important impacts on future demand for transportation.

- *Metropolitan Areas as Economic Units:* One of the most significant population trends over the past 100 years in the U.S., and indeed the world, has been the increasing proportion of the Nation's population that lives in urban areas. Fifty years ago, this meant cities. Today, this means metropolitan areas. Metropolitan areas are now the economic "machine" that produce the wealth of the Nation. Tied together by telecommunication services and transportation facilities, metropolitan economies have also become the major national links to the global economy. How does transportation system performance relate to the effective functioning of such metropolitan areas? What is the degree of exchange or interchange between metropolitan areas, and how does this depend on efficient transportation? To what extent can telecommunications substitute for what was traditionally a physical movement afforded by the transportation system? These are critical questions for economic success in the future.
- *Globalization:* Certainly, many pundits have identified globalization or the global market as one of the defining characteristics of our age and that of the future. Thus, my suggesting this characteristic of our economic future should come as no surprise. Some recent estimates from the U.S. Bureau of Transportation Statistics illustrate how important trade is to the U.S.¹

The U.S. is the world's largest merchandise-trading nation, accounting for 12 percent of the world's merchandise exports and about 19 percent of the world's merchandise imports in 2000.

By 2001, U.S. international merchandise trade was more than 20 times greater than in 1970 (while total economic output was about 10 times greater).

From 1990 to 2001, the value of U.S. international merchandise trade more than doubled, from \$891 billion to over \$2 trillion (in inflation-adjusted dollars). This growth represented an average annual rate of eight percent while the corresponding annual rate for the GDP was three percent.

¹U.S. Bureau of Transportation Statistics, *U.S. International Trade and Freight Transportation Trends*, Feb. 2003.

The ratio of U.S. merchandise trade to the value of GDP reached about 22 percent in 2001, whereas in 1990 it was 13 percent. However, a more relevant measure of the importance of goods exports to the U.S. economy is the percentage of merchandise exports to goods GDP. This ratio was 43 percent in 2000, whereas in 1970 it was 15 percent.

In 2001, the U.S. transportation system carried \$736 billion worth of merchandise exports and \$1.2 trillion of merchandise imports.

I had the opportunity over the past two years of visiting Europe and Latin America as part of the U.S. DOT's international scanning program, with a focus on discovering how the Europeans and Latin Americans have prepared for, and what their expectations are, regarding future trade. The focus of both scans was on the implications to our nation's transportation system. If even half of what is predicted comes true, our nation's ports and the transportation systems that serve them will be severely strained to handle the expected trade.

In Latin America, for example, the extension of NAFTA in some form to other parts of the region could have a significant impact on not only our border states, but on all states that have economic linkages to that market. Table 1, for example, shows the states that export more than \$400 million annually to different parts of Latin America. As can be seen, all regions of the country are participating in this important trade relationship. The globalization of the market place, and its implications to transportation, are thus critical factors in future success of our nation's economy.

- *Increasing Efficiencies in Production:* A market economy thrives on efficiency. The extent to which costs can be reduced, economies of scaled gained and uncertainty in the production process removed, the economy will benefit. It is not surprising therefore that our nation's goods movement industries (i.e., rail, trucking air cargo, and waterborne) are continually seeking ways of reducing costs. With the increasing globalization of the economy, such efficiency becomes even more important to compete effectively in the world market. Free trade agreements, globalization of the production process, diversification of employment sites, innovations in goods movement that increase productivity but which shift flows (e.g., containerization), and larger capacity/faster goods movements all have important impacts on our nation's transportation system. To provide the service necessary to support these trends in goods movement, transportation officials not only need to remove the bottlenecks that impede efficient movement of goods, but also to provide enhanced reliability of transportation system performance, from origin to destination.
- *An Information Technology-Based Economy:* Information technologies pervade every aspect of modern life. They have revolutionized the way we do business, how we educate our young and retrain our workers, the manner in which we now amuse ourselves in entertainment and recreation, and how we keep in touch with world events and with each other. In logistics, information technologies have permitted the just-in-time production processes with their communications and global positioning capabilities. In transportation, it is still not clear whether information technologies will be a substitute for travel, or because of the ease of communication cause more desire and need for physical movement. For example, although tele-shopping can substitute for a trip to a store, there is some evidence to suggest that the ease of doing so has created more package delivery trips, thus raising important questions about how such freight movement should occur in the most efficient manner.

The impact of information technology on the economy, on our daily activities, and on transportation is perhaps the most important factor influencing future transportation system performance. This is also a characteristic of our society that is most difficult to predict. The timeline for advances in information technologies is short; the knowledge of what is being contemplated is often guarded; and the indirect impacts on daily life often unexpected. The private transportation sector is often in a position to respond quickly to changes in technological capability given the relatively short timeframe in its investment strategies (two to five years). However, the public sector investment portfolio often occurs over a 20- to 25-year timeframe. It is critical for such investment horizons that intermediate scans be conducted on the influence of technology on societal behavior. This type of research might be more speculative than others suggested in this testimony, but my belief is that it might have greater impact on the types of investment decisions that are made by transportation agencies.

Demographic/Social: Every ten years, the transportation profession devotes considerable attention to the latest demographic data from the U.S. Census. And every ten years, the transportation profession seems surprised by some findings of this data that could, in fact, have been anticipated. For example, the 1990 Census showed a very substantial in-migration of non-U.S.-born citizens and non-citizens into many of our nation's metropolitan areas. In fact, in some cities, this in-migration represented the largest portion of the population growth in the urban area. This phenomenon has had important consequences to many components of the urban social fabric—education, social services, welfare, and transportation. We simply did not anticipate such growth, and certainly had not included it in many of our transportation plans and analyses.

Figure 1 shows a very simple relationship between several demographic and population characteristics and the resulting travel, in this case measured in vehicle miles traveled. As shown, the important factors that have affected the amount of personal travel relates to such things as growth in population and jobs, where this growth has occurred (during the last 30 years primarily in the suburbs), characteristics of the household, and importantly, changing characteristics of mobility such as the increasing frequency of travelers with drivers licenses and the relative decline in the availability of modes of travel in comparison to the automobile. I do not suggest that Figure 1 captures all of the demographic and population factors that influence travel, but it does illustrate how several key factors work together to place increasing demands on our nation's transportation system.

Some of the demographic/social trends that are going to have significant consequences to our nation's transportation system include the following:

- *Population Growth:* According to the U.S. Census, the U.S. population is expected to grow to about 338 million by the year 2025, and reach just over 400 million by 2050. This growth will come from natural increases in current population as well as immigration. The trends over the past 40 years suggests that much of this population growth will occur in metropolitan areas, thus adding to the transportation challenges that many of our cities are currently facing. The implications to transportation investment and to the impacts on the environment of this growth are significant. With our existing transportation system demanding more resources to maintain what we have already put in place, the Nation will have to think carefully and significantly on how this growth is accommodated.
- *Population Composition:* Interestingly, large portions of the expected growth in population will come from what are considered today as minority groups. Population trends suggest that many of our urban and rural areas will have large bi- or multi-lingual ethnic groups, more than are found today. Figure 2, for example, shows the growth in minority population in the 10 metropolitan Atlanta counties from 1990 to 2000. Many transportation planners in the Atlanta region have been surprised by the tremendous increase in Hispanic, Asian, and African-American population groups in the suburban counties. The implications to transportation of this important demographic trend have not been examined in any significant way. They range from how alternative transportation services will be provided for these population groups to the methods of disseminating information on the availability of these services.

Immigration also presents special challenges to transportation planners. Immigrants tend to locate in metropolitan areas (by 90 percent), and within metropolitan areas, in central cities over suburbs (55 percent to 45 percent). For example, the cities with the largest increases in zero-vehicle households between 1980 and 1990 were Miami, San Diego, and Phoenix, cities experiencing large increases in Spanish-speaking immigrants. As immigrants become assimilated into society, it is likely that they will represent a new wave of automobile drivers. In the short-term, transportation options that provide access to jobs will become a major issue.

- *Aging:* Just as the 1950s and 1960s saw the beginning of the Baby Boom generation, the decades of 2000 and 2010 will see its retirement. The 2000 Census saw for the first time that there are as many Americans over the age of 35 as there are under. I suspect there will be no more important demographic trend over the next 30 to 40 years that will have greater influence on our society than the aging of America. Mobility for the elderly, especially given that this group now more than ever will be driving into their later years, creates a special challenge to transportation planners. This could have important implications on how travel information is disseminated, the importance of non-

work trips as they relate to daily travel, and the provision of transportation services to the elderly population.

- *The Aging of Suburbia:* Some of the preliminary results of the 2000 Census suggest that large numbers of Americans, instead of retiring to the traditional warm weather climates of the South and Southwest, are either staying where they have lived for many years, or are moving to be closer to family. And importantly, many of these homes are in the suburbs. This will have important consequences for health care, housing, and transportation in those cities that might not have yet faced these issues at such a magnitude.
- *Low-income Population:* Trends in income characteristics over the past 30 years suggest that the disparity between the higher and lower income quartiles of the population is becoming greater over time. The economic prosperity of our nation over this time period has not benefited everyone. One of the disturbing aspects of this phenomenon is the number of elderly who fit into the low income group. Table 2, for example, shows the percent of the population over 65 years of age in selected cities that are below the poverty level. This issue has important implications for transportation in terms of delivering critical services to this part of our population, as well as supporting a quality of life that all our citizens deserve.
- *Rural Population:* Although much of the future population growth will occur in metropolitan areas, a substantial amount of our nation's population will still live in rural areas. Much of this population will also be aging in place, thus creating similar types of challenges as those mentioned above for the aging of the suburbs. Telecommunication technologies are providing, and will likely continue to provide, important services in health care and educational opportunities. However, mobility for an aging rural population will likely be an increasing concern for state and rural communities.

Social trends are very much intertwined with the economic and demographic trends discussed above. Thus, the increasing members of minority populations, increasing urbanization, the aging of the population, and increasing disparity between income groups all affect the social interactions that occur in a community. The transportation profession has made great strides in understanding the social impacts of transportation system performance, and the distributional effects that such impacts have on different population groups. However, much has yet to be known. The strategic environmental research program being discussed today offers many important topics on social impacts that deserve increasing attention.

There are two important social trends that I suspect over the long-term will be very important to the way we live as a society. The first relates to the increasing disparity among income groups in the Nation, and what this says about the "sense of community" that has served as an important foundation for the development of this nation over two centuries. In an increasingly connected society, mobility becomes an important pre-requisite for success. Not only does mobility provide a means of reaching jobs and thus of assuring an opportunity for making a living, but it also provides accessibility to health care, education, recreation, shopping, in short, all of the aspect of daily life that provides the quality of life for our citizens. With limited transportation resources, transportation officials naturally invest in those parts of the transportation system that have the greatest levels of congestion or the highest accident rates. But I would argue that providing mobility options is different than reducing congestion. Congestion is a simply a symptom of deficient system performance, and certainly one that needs to be addressed. However, our focus should be on mobility. . . for all segments of society.

The second social trend that will become more important, in my opinion, is public concern for environmental quality. Surveys have for years indicated that the public is concerned about the degradation of the environment and that steps should be taken to preserve the quality of our surrounding natural environment. A growing population and concomitant increases in development will have important consequences to our nation's natural resources. We are already seeing in many parts of the Nation, including in my own metropolitan area of Atlanta, concern about the over-consumption of such resources, resulting in depleted water supplies and poor air quality. I have just completed a research project that examined how environmental considerations can be included much earlier in our transportation planning and decision-making processes so that not only will project development occur much more expeditiously, but better decisions will result. I believe that the social context of our environmental quality and the importance of including these concerns into transportation decisions is one of the factors that will strongly influence transportation policy at all levels of government in future decades. Research is needed now to pave the way.

A strategic research effort to understand the effects of these economic, demographic, and social factors will provide important information to decisions on future investments in the transportation system. Such an effort would include many different disciplines, with strong participation from the social sciences. Social scientists have made important contributions to our understanding of how society functions, and how investments such as those directed to transportation can influence the evolution of development and civic form. However, the application of social science research to transportation has not been done in a systematic way as is found in other types of transportation research. Thus, I do not believe that our nation is gaining as much as it could from the benefits of such research if applied in a strategic and comprehensive way.

For example, one of the most important contributions that could be made by social scientists is in evaluation research, that is, examining the impacts and influences of changes in transportation system performance on economic, demographic and social variables. This type of research depends on a rigorous experimental design that controls for external influences on the phenomenon under investigation so that the researcher is able to determine causality. With the massive amounts of investment in our nation's transportation system, over \$140 billion from all levels of government, it is incomprehensible why we do not have a better understanding of the impacts of such investment. I was a member of a Transportation Research Board (TRB) panel that, at the request of Congress, examined the effectiveness of the Congestion Mitigation and Air Quality (CMAQ) program. One of the major findings of this effort was that very little effort was made to evaluate the impact of CMAQ investments on air quality or on transportation system performance. The panel recommended that a portion of the CMAQ funds be set aside to provide the wherewithal to conduct such investigations. Much of this type of research would depend on the application of social science methodology and research design.

Research supported by the U.S. DOT, National Research Council (primarily the Transportation Research Board), National Science Foundation, state DOTs, non-governmental organizations, and philanthropic foundations provide an important starting point for the type of research I am proposing. However, much of the research supported by transportation agencies is focused on near-term applications and near immediate value added to an agency's operations. Very little interest has been shown by transportation agencies on the broader types of questions posed above. The closest that substantial amounts of research have been available for such research is in the area of human factors where there are important questions concerning the relationship between human characteristics and driver behavior.

Important studies have been conducted by the TRB on the types of policy questions suggested above. However, these have usually been in response to Congressional requests included in legislation, and thus subject to the interest of members of Congress at a particular point in time. And until recently, the National Science Foundation (NSF) has provided little support for such research, with the rationale that it would rather focus its limited resources on issues for which a large governmental research base was not available. Importantly, the increasing attention of NSF to transportation has focused on the application of advanced technologies and improvements to network efficiency, not the type of policy questions that could have important repercussions on whether such technologies will be used.

Thus, I conclude that important policy questions that are critical for the future success of our transportation system are not being examined in any systematic way. Social science research is critical to answering some of these questions, and the best way of focusing such capabilities is by targeting resources on these types of policy questions. What is the best means of doing this?

Determining the most appropriate entity for guiding, managing or conducting this type of policy research depends very much on the desired characteristics of the approach to be adopted. There are many organizational models that could be used for undertaking this type of research. Given the policy nature of the questions being asked, a logical home might very well be in the U.S. Department of Transportation. Given the desired application of social science knowledge and methodology to these questions, the National Science Foundation with its many years of experience in social science research could provide a suitable home for such a program. My own criteria for selecting an organizational framework include the following:

1. The research should be well-founded in any body of science and knowledge that is appropriate for addressing these questions. Thus, the organizing entity should have the ability to convene researchers with a variety of backgrounds.
2. Although not absolutely critical for success, the organizing entity should have some familiarity with transportation research and with the basic rela-

tionships between transportation system performance and the economic, demographic, and social factors that influence it.

3. The program should provide a rigorous peer-reviewed process of research proposals and research results.
4. The organizing entity should be credible in the eyes of both the research community as well as the policy-makers that will use the research results.
5. Similar to number 4 in establishing credibility, the organizing entity should have a position of impartiality that shelters it from pressures to come up with an answer that best suits the conventional wisdom of the day.
6. The organizing entity should have an established means for disseminating the results of the research to the research community, practitioners, and most importantly to policy-makers.

These criteria lead me to the National Research Council, and more specifically the Transportation Research Board (TRB) as the most appropriate means of accomplishing the type of research described previously. The TRB has decades of experience in bringing together the types of researchers that would be necessary for this research. As noted previously, however, most of the research managed by the TRB is defined either by the sponsoring agencies (i.e., the state transportation agencies or transit agencies) or through Congressional requests. Thus, I believe a new research program under TRB auspices is needed, one that is modeled after the successful National Cooperative Highway Research (NCHRP) and Transit Cooperative Research (TCRP) Programs, but where the research topics are selected by a panel (perhaps a permanent subcommittee of TRB's Executive Committee) that focus on important policy questions. We need a more systematic program for conducting such policy research, and the TRB is the most appropriate entity for doing this.

There is one area of policy research where I believe the federal transportation agencies can play an important role, and this is in measuring the performance of the transportation system with respect to the national goals outlined in both ISTEA and TEA-21. Both ISTEA in 1991 and TEA-21 in 1998 represented an important turning point in federal transportation legislative history. In many ways, these important laws provided a point of departure for the substance and intent of the federally-aided transportation program that was to be put in place subsequent to the completion of the Interstate highway program. They defined national goals for transportation relating to mobility, safety and security, economic vitality, system preservation, and environmental protection. But nowhere that I have been able to find is there a reporting of how effective transportation investment is in achieving these goals.

The Bureau of Transportation Statistics of the U.S. Department of Transportation has developed a long list of "transportation indicators" that are monitored annually to provide a national snapshot of how the transportation system is performing. When compared over time, national trends in this performance can be identified and hopefully related to needed changes in policy. However, although this list is commendable in its comprehensiveness, it is difficult to use in gauging whether Congressionally-defined national transportation goals are being met through the investments made by the 50 state departments of transportation (DOTs) and hundreds of metropolitan planning organizations (MPOs).

Such an effort would be challenging. The first issue is defining the most appropriate measures relating to these national goals. The transportation engineering profession has done a good job of defining what would be meant by "system preservation." However, I suspect that there would be strong debate on what constitutes the best way of measuring mobility, economic vitality, national security, and even environmental protection. Research is needed in both the social and natural sciences to identify the most appropriate way of determining the effect of transportation investments in these areas.

A second issue relates to the spatial and temporal scale of application of performance measurement. For example, if one wants to understand at a national level the impact of significant changes in transportation investment on economic vitality, it is not likely that measurable differences will occur in a short period of time. It takes time to provide the infrastructure and services that result from new investment opportunities and thus, in many ways, the impacts of changing levels of transportation investment will likely occur many years after this investment is made available. As noted previously as well, very few transportation agencies conduct evaluation studies of the effects of transportation investment. Thus, at the level of individual projects or even state or regional programs, we simply do not know what impact this investment is having on non-traditional measures of performance (we are pretty good at measuring trip travel times and speeds). In both cases, historical analysis

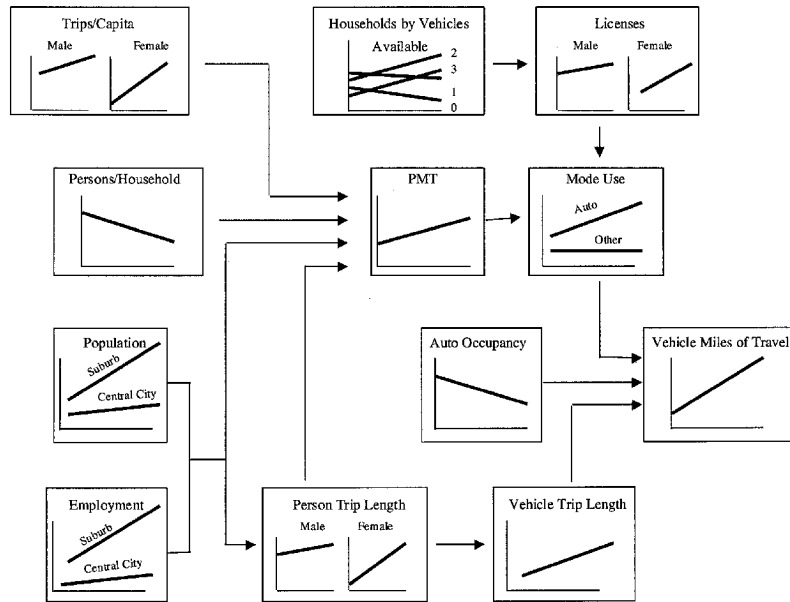
of previous transportation investment and what happened to key indicators of societal benefits can be used to discern what will likely happen in the future. Such an approach to policy analysis is strongly founded in the social sciences.

A third issue relates to an institutional reluctance to define a set of performance measures that capture the many different aspects of transportation system performance and the relationship to its societal context. Many state DOTs and MPOs have expressed concern that such performance measurement could be used in a scheme to allocate federal transportation dollars. Others are concerned that performance measures might be used to rate the effectiveness of one agency versus another. Although some interesting research could be conducted by political scientists and organizational theorists on strategies to overcome this reluctance, I suspect that success in overcoming this barrier will relate more to policy guidance from the Federal Government than it will on the results of social science research.

The Bureau of Transportation Statistics is uniquely positioned to support the policy research that can lead to a better measurement of national achievement of transportation goals. It already has begun to collect data on national indicators of performance. However, although this list is useful in understanding the many different dimensions of transportation system impacts on our society, it is simply too long for use in determining whether national goals as set forth in TEA-21 are being achieved. A more targeted set of measures, relating specifically to these goals, should be established and monitored over time.

Mr. Chairman, I appreciate the opportunity to speak before the Committee. Our nation is blessed with substantial research capabilities that can be tapped to better position ourselves for the challenges and opportunities we will face in the future. Global economic competition will be a driving force in future years. Transportation system performance will very much be a part of our ability to compete effectively in this arena. Our economy and our quality of life depend on an efficient and effective transportation system. The theme of my testimony is that much of the transportation research conducted in this country is focused on very important issues that will improve our abilities in very targeted areas. But very little research in being conducted in a systematic and programmatic way on the bigger policy issues that could have monumental impacts on how the Nation deals with future challenges. We need to be ahead of the game on these issues; to anticipate what challenges they present to national, state and local decision-makers; and to pro-actively put in place policies and programs that will meet these challenges, rather than reacting to them once they have occurred.

Thank you for your time and attention.



Note: The relationships between these variables over the passage of time (denoted by the x-axis) are represented as being linear. This is done simply to illustrate basic relationships and their direction. There is clear evidence that such linearity is not the correct functional form for many of these relationships.

Source: [Meyer, M. and E. Miller, *Urban Transportation Planning: A Decision-Oriented Approach*, 2nd ed., New York: McGraw-Hill, 2001]

Figure 1: Factors Influencing Urban Travel Behavior

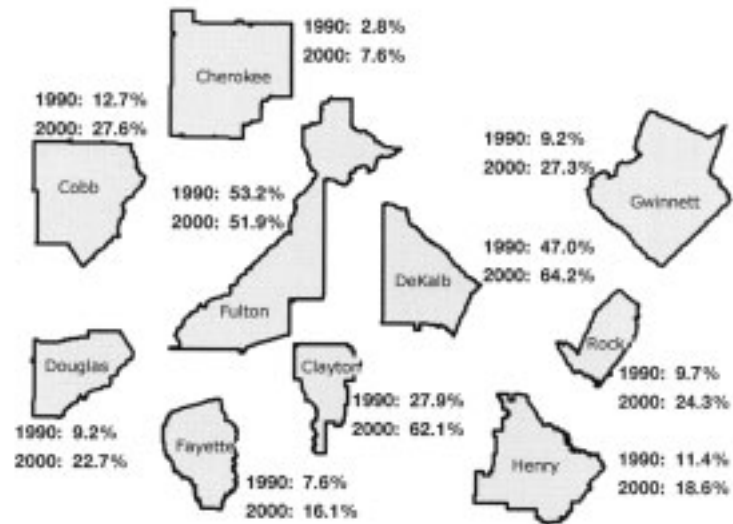


Figure 2: Change in Minority Population in the Atlanta Metropolitan Area, 1990-2000 (Source: U.S. Census)

Table 1: State Exports to Selected Regions of Latin America (<http://ese.export.gov>)

States With Exports to <u>Central America</u> Exceeding \$400 Million Annually, 2001			
FL	\$2,164,106,000	NC	\$753,382,000
TX	\$755,486,000	CA	\$743,434,000
		KY	\$440,548,000
		GA	419,073,000
States With Exports to <u>South America</u> Exceeding \$400 Million Annually, 2001			
TX	\$6,758,712,000	MI	\$1,533,849,000
FL	\$5,991,862,000	NJ	\$1,493,431,000
CA	\$3,061,438,000	PA	\$1,211,152,000
IL	\$2,453,879,000	WA	1,029,518,000
NY	\$2,011,147,000	IN	\$1,019,246,000
		OH	\$973,020,000
		CT	\$667,256,000
		GA	\$652,544,000
		NC	\$634,406,000
		MA	\$573,398,000
		WI	\$572,525,000
		MO	\$553,024,000
		TN	\$516,623,000
		MN	\$420,960,000
States With Exports to <u>Mexico</u> Exceeding \$400 Million Annually, 2001			
TX	\$19,451,302,000	IN	\$2,346,196,000
MI	\$15,451,313,000	NJ	\$2,192,870,000
CA	\$13,598,830,000	GA	\$2,022,411,000
OH	\$5,139,692,000	NC	\$1,952,927,000
IL	\$3,603,758,000	AZ	\$1,900,803,000
NY	\$2,971,943,000	TN	\$1,692,923,000
FL	\$2,589,688,000	SC	\$1,381,184,000
PA	\$2,416,006,000	MN	\$1,350,593,000
		MO	\$1,170,518,000
		MA	\$1,169,281,000
		WI	\$1,055,424,000
		CO	\$1,039,016,000
		WA	\$1,031,050,000
		VA	\$992,224,000
		CT	\$981,674,000
		KS	\$782,147,000
		NM	\$760,841,000
		KY	\$721,086,000
		AL	\$596,235,000
		MS	\$495,574,000
		MD	\$474,823,000
		DE	\$467,681,000

Table 2: Percent of Population 65 Years and Over That are Below Poverty Level

Rank	Place	Percent	Lower Bound	Upper Bound
1	Miami city, FL	35.4	28.1	42.7
2	Cincinnati city, OH	23.1	15.0	31.2
3	Atlanta city, GA	22.9	16.5	29.3
4	Chicago city, IL	20.7	18.1	23.3
4	Philadelphia city, PA	20.7	17.1	24.3

Source: American Community Survey, 2001

DISCUSSION

ARE WE SPENDING ENOUGH ON TRANSPORTATION
RESEARCH? HOW SHOULD THE FUNDING BE ALLOCATED?

Chairman EHLERS. I thank the panel for their testimony. It has been extremely helpful, and I noticed in several cases you have reinforced each other's suggestions. We will now turn to questioning, but let me first observe in the last week, as I have, for the first time in my life, really examined carefully the whole structure of transportation research, I certainly have a number of concerns. And frankly, as an experienced research person, I would be very reluctant to try to head up a research organization that is this bifurcated and subject to outside direction, to put it politely, by the Congress and others. And I think it would be almost impossible to manage the way it is structured and directed. And so my goal is to try to really put together a program that makes sense from the research standpoint by defining, first of all, what we are trying to accomplish with the research, and secondly, how can we best accomplish that.

And I am not sure that question was asked in TEA-21 or ISTEA, but at the same time, I recognize the difficulty of directing research. I was reminded by that this morning when one of my colleagues made a comment about Columbus, who of course, went on a great research trip to try to find a route to bring home some spices. And obviously, his entire project failed tremendously, because he didn't come back with any spices at all. So we have to keep in mind that research is a very uncertain quantity. And nevertheless, it can be managed and directed in a way that is very fruitful.

I will begin the questioning, and I will yield myself five minutes.

First of all, I am going to ask some simple yes and no questions, and then we will get into a little more depth than that. First question, and I will just go right down the line, and normally I don't ask yes or no questions, because I am not an attorney, thank goodness. But the first question is: do we currently invest enough funding in surface transportation research? Mr. Frankel?

Mr. FRANKEL. I think the answer to that is there can always be more, sir, but I think the answer is yes. I think there is a good record of investment, and that investment in research is growing.

Chairman EHLERS. Mr. Harm, do we invest enough?

Mr. HARM. No, I think we can always expand. You mentioned even in your own opening comments about the $\frac{1}{2}$ percent of one percent that we invest based on that, and all of the other industries are in the five to 10 percent, so I think we—there is room to expand.

Chairman EHLERS. Dr. Walton.

Dr. WALTON. No, sir.

Chairman EHLERS. Ms. Siggerud.

Ms. SIGGERUD. Mr. Chairman, our work didn't specifically address that issue, but I can say that what we think is important in terms of any resources that are devoted, increased or not, is building an accountability in using those resources.

Chairman EHLERS. Okay. Ms. Canby.

Ms. CANBY. Mr. Chairman, by any measure, I would say we are under-investing in research in transportation.

Chairman EHLERS. Dr. Meyer.

Dr. MEYER. No, we are close. No.

Chairman EHLERS. Okay. The second question: the TEA-21 reauthorization, if the total amount of funding does not grow or grows only slightly, should we still increase funding for research? In other words, should we give it a higher priority and within the context of essentially the same funding? And this only has to be answered by those of you who answered yes already. Obviously, if you said no before, I know what your answer is. Mr. Harm.

Mr. HARM. I think it should be increased more so than just the—if TEA-21 or the next, what do you call it, TEA Next?

Chairman EHLERS. TEAM LOU.

Mr. HARM. TEAM LOU goes—the—I think we—it should still be considered even an increase—higher increase.

Chairman EHLERS. Dr. Walton.

Dr. WALTON. It should be increased.

Chairman EHLERS. Ms. Siggerud, any comment?

Ms. SIGGERUD. Well, I am not sure I said yes, but—

Chairman EHLERS. No, you didn't. Well, I am not sure what you said.

Ms. SIGGERUD. I will try to be more clear this time. What we are looking for in terms of reauthorization is building in accountability and peer review and external stakeholder involvement to direct the program in a quality and relevant way.

Chairman EHLERS. In other words, you want more for the same money. Ms. Canby.

Ms. CANBY. I would say we could find ways to do some reallocation.

Chairman EHLERS. Dr. Meyer.

Dr. MEYER. Mr. Chairman, in a previous life, I was Director of Transportation Planning and thus responsible for research and—in the one state at least. And I am convinced that the value of that research more than pays for itself in terms of greater efficiencies and products, so the answer is clearly yes in my opinion.

Chairman EHLERS. Yeah, that has been my experience, too, particularly in applied—more applied research such as the Department engages in. The follow-up then is do you believe the current funding is balanced between the different areas of research, such as the research on pavement, in other words the hardware or research on operations, research on policies? You may have some other breakdowns you would want. What I am really interested is not whether or not you think it is balanced now, but how would you recommend altering the balance or allocation at this point? Mr. Frankel. Well, let us start from the other end this time, Dr. Meyer.

Dr. MEYER. Well, given my statement, Mr. Chairman, I think the answer to that is fairly clear. Given that I argued for more emphasis on policy research, again, my sense is that a lot of the research that is being done is very tactical, operations oriented, and I think that is very important. To me, the policy research is, in many ways, the brains of what we are trying to do, anticipate the future, figure out where we—how we can position ourselves, so I would

strongly recommend that more attention be given to the policy research side of things.

Chairman EHLERS. Ms. Canby.

Ms. CANBY. Mr. Chairman, I would suggest that, following on Dr. Meyer's comments, that we do as he suggests and also focus more on integrating all of the transportation modes as one system rather than looking at them singly and independently. They are one system. That is how the public sees it.

Chairman EHLERS. Ms. Siggerud, do you have any comment based on your research?

Ms. SIGGERUD. Yes, I do. Our research essentially boiled down to really needing a strategic focus for the highway research program as a whole. I would strongly suggest that the strategic goals set out for the Federal Highway Administration, mobility and productivity, human natural environment, security and safety be looked at and make sure that those are being treated well in any kind of a new focus of the research program.

Chairman EHLERS. Thank you. Dr. Walton.

Dr. WALTON. Mr. Chairman, as I indicated, I think that the notion of a strategic business plan for transportation R&D is vitally needed. And in fact, it is not only a top-down but a bottom-up approach and clearly, beyond a more rigorous approach than is currently available within the agency. And in so doing, there would be a natural reallocation based on the vision and the priorities.

Chairman EHLERS. Mr. Harm.

Mr. HARM. We are really good at doing the rocks and pavements and bridges, but I think we really need to start expanding in the multidisciplinary areas that other people have talked about, the human factors and everything else. So I think we need to probably go away a little bit, because we can't just build out of this. We have to have the innovation in some of the technology issues that we have to deal with, this congestion issue and everything else. So we can't build out of it, so we have to reallocate a little bit. But we still need to do some of the basic rocks and pavements and stuff, too.

Chairman EHLERS. Yeah. Mr. Frankel.

Mr. FRANKEL. Mr. Chairman, as you know, I think we have made progress in the Department under TEA-21, in particular, in developing a more strategic vision of transportation research, surface transportation research that is reflected in the development of a research plan, research strategic plan, on an annual basis and relating those to the Department's strategic goals. So I think there has been progress. I am sure there needs to be more progress, and we will talk about that, I am sure. And I know it is a real interest of yours in terms of coordination across modes.

Having said that, obviously the institutional history of the Department is organized in modal administrations. Much of the research program develops from the ground up, if you will. And as you also indicated in your remarks, much of it is directed to applied—what I would call applied research. This is—I am a lawyer, and not a—don't have a research background, but nonetheless, I think would be defined in that way with more immediate impacts.

In terms of the more—of this more strategic vision across modes, I think that much of this can, and we hope will, come from the Of-

office of the Secretary. But frankly, it is difficult to get support for funding of research, including policy research, within the Office of the Secretary, as I am sure you are well aware. It is something generally, respectfully, frowned upon in the appropriating process in this institution. And oftentimes the research money that does come to the Office of the Secretary, our office, policy office is heavily or substantially earmarked. So that while the goals you describe and have been talked about here are, in my opinion, appropriate, ones that we should continue to work towards, I think we have to deal with some institutional arrangements that obstruct or constrain the achievement of those goals in really shaping a strategic vision and establishing the priorities and the allocations along the lines I think implicit certainly in your question.

Chairman EHLERS. Thank you all. My time has expired. I recognize the gentleman for Colorado.

Mr. UDALL. Thank you, Mr. Chairman. I, too, want to thank the panel for your testimony. And I think we are narrowing down the options and the opportunities that we have. And I think the Chairman's questions were really getting us off in the right—heading off in the right direction.

Turning to Secretary Frankel, I understand you have got a tough job. You have got to do a lot of things with limited resources, and I know you are pleased with what you have accomplished, and always you want to do more. When can we expect the Administration to present a proposal in regards to reauthorization for surface transportation programs, at least an outline or a list of priorities for retention or alterations of existing programs?

Mr. FRANKEL. Congressman, the Administration's bill is in, I think I can say this, in the last stages of the clearance and inter-agency review process, something that I am getting educated in. Unlike some of my friends, I have never gone through this on this side of the table, if you will. But I have every hope and expectation that that process will be completed very soon. I can—I think I can see the finish line, and I think we are within a matter of a couple weeks, frankly, being able to introduce the Administration's bill. I hope I won't get in trouble with the Director of OMB for saying that, but I think that is the case.

Mr. UDALL. In that spirit, what did you base your fiscal year 2004 request upon if you haven't yet developed your priorities for reauthorization?

Mr. FRANKEL. Well, and I—it is—your question really includes, but I know goes beyond the research agenda and—

Mr. UDALL. Yes.

Mr. FRANKEL [continuing]. Our process of developing this bill began in very early 2002. We have been at this for 14 or 15 months. As a matter of fact, the Secretary testified, not to this committee, but testified to other Committees in the House. Early in 2002, we testified before Senate Committees at a similar time laying out the goals and principles for the reauthorization. And there has been a great deal of interaction between the budget process and the development of this bill so that I think it is fair to say that the President's budget for fiscal year 2004, at least as—with regard to our Department, incorporates principles, not only funding levels, which I am sure you are all aware of, but also principles and pro-

grams, which will be contained within the proposal. So it really is very much an indicator of what is going to be in the bill even though the bill itself has not formally been introduced.

POLICY VS. TECHNICAL RESEARCH

Mr. UDALL. Thank you. I thought I would take my remaining time and focus on Dr. Meyer and Ms. Canby, who both have a connection to Massachusetts, I note, in the public sector. You all talked, I think, with some real heft about the need to focus a bit more on the policy side of the research equation versus the technical side. And I know—and as I was trying to say to Secretary Frankel, the pressure is to get the jobs done in the states that are already in front of us. And so I think research dollars tend to be directed at those technical fixes. How would you go about making more of an emphasis on the policy research side while not short-changing the technical research side?

Dr. MEYER. Are you referring to in terms of administratively how would one do that or the types of issues?

Mr. UDALL. It is a wide open question, yeah. I am trying to get us to where you all suggest we should head.

Dr. MEYER. Well, I—there are many answers to that question, I think. I guess I have been around long enough to have been—I have gone through several cycles in terms of investment and non-investment and what the policy issues are and they are not. I can't tell you how many times I have been to conferences and meetings where the phrase, "It is all institutional; it is not technical. If we can only figure out the institutional issues, we would be able to do things much quicker." That is policy research. That is institutional research. That is looking at public administration. That is looking at organizational theory, all of those types of aspects that could be brought to bear in terms of how to become more efficient in those types of things. I believe that the way one goes about doing this is as I have suggested, which is you set up a program not under the DOT, because I do believe, as was mentioned earlier, that there are certain pressures in the U.S. DOT that are probably going to be somewhat insurmountable in terms of focusing that particular research program. I think it does need to be a separate program. I think it does need to be a peer review program. I think it does need to be a program where social scientists and engineers and technologists and others can really come together to look at these issues and really anticipate what is going to happen.

So my recommendation of how to do this without seriously affecting, if you will, the technical-oriented research program is really to set up—and I am not talking about a big program. I am talking about a fairly modest program. And policy research, a fairly minor amount of money can go an awful long ways in terms of really addressing these issues so that we are ahead of the game rather than behind the game when the issues come into the floor.

Mr. UDALL. Ms. Canby, we haven't left you much time, but—

Ms. CANBY. That is all right. I mean, we expect this with my friend here.

Dr. MEYER. I beg your pardon.

Ms. CANBY. A couple of areas, Congressman. One, the environmental cooperative research program, I think, would add a perspec-

tive to the research field that we are missing today and the items that have been identified in a study published by TRB last fall. Yeah. The concept of a metropolitan planning and research program, as Dr. Meyer suggested. Metropolitan regions are really economic engines in this country today, and I don't know that we are focusing enough research attention on these entities and the complexities of those areas. And third, the need for the interdisciplinary research that possibly within the National Academy of Sciences family. Somebody recently told me just by way of illustration that they were attending a session, which is sponsored by TRB and the Institute of Medicine. And the comment was, "You don't see that combination very often." I say indeed we don't and indeed we should across many more disciplines.

Mr. UDALL. Thank you. And I thank the Chairman for the time. I think we really need to work toward including the end users in these approaches, and I would hope that the social science community and others can look through the eyes of the commuters and all of the general public that is, in the end, being affected by these programs.

Chairman EHLERS. The gentleman's time has expired. I am pleased to recognize the gentleman from Minnesota, Mr. Gutknecht.

METERED RAMPS AND PUBLIC EXPERIENCE

Mr. GUTKNECHT. Thank you, Mr. Chairman. And first of all, let me say to the panel, these are very busy times here in Washington, and I want to thank the staff for assembling such a distinguished group. And I apologize we don't have a better attendance, but there are an awful lot of things going on here in Washington, especially right now.

I want to come back to a point, because we have had some debate back in my state capital in St. Paul about metered ramps. And there—I think the jury is still out. My own opinion is there are certainly times and places they make some sense, but there are times and places where I have said this makes no sense. And I wonder if any of you would like to comment on the success or lack thereof of metered ramps and the experiment that has been going on in the Twin Cities.

Mr. FRANKEL. I will have to pass on that or talk to my colleagues a little, because I am not sure I am familiar with that, Congressman, so—

Mr. HARM. I guess from my experience, it is in the eye of the beholder. I think if you look at your DOT people and I think they think a lot of—it does work in the big system. In the big system, it probably makes the whole thing work. But when, I think, you make reference to when you are sitting there and it looks like there is—the traffic is not congested and you are waiting there at the stop light not allowing yourself to get onto the ramp that your little world—it makes it look like it doesn't make sense. So I think it is all from a perspective of the user. In your case, if you are sitting there at the ramp, sometimes it looks like it doesn't—is ineffective. But in the big picture, probably from the DOT standpoint, there is some—in the system, it is probably more an efficient way

of moving people through. So in Illinois it works when we use it, and we have not had major complaints.

Mr. FRANKEL. If I might say—

Mr. GUTKNECHT. Go ahead.

Mr. FRANKEL [continuing]. Congressman, I am sorry, having been informed that you were referring to ramp metering experiments. I didn't realize that. I—and I apologize. I can't speak about the details of it. I—there are situations in which these demonstrations have been successful. But as just one of my colleagues was pointing out to me that one of the fruits, I think, of the research efforts we are doing in the ITS and other operational programs in the department is the ability to sit—do traffic simulations. And I think we can learn through the investment of research dollars the success in ramp metering in really making a difference in terms of management of our highway—management of limited capacity and improving congestion.

Mr. GUTKNECHT. Anybody else want to comment? Yeah. Please.

Dr. WALTON. Congressman, I think the experience on ramp metering and other types of control measures that are used on access control facilities have been in practice now for over 15 to 20 years in various kinds, and we have learned a great deal about their application, where they are best used. For the most part, you know, there is not one type of application that will work effectively in all situations and all cases, but where the right strategy is used for managing freeway flow, we found a significant improvement. And as we get more of our freeways and access control facilities integrated into an ITS system, if you will, for traffic management. We are realizing substantial increases, so consequently, in the specific case that you are referring to, I know there have been a variety of instances back and forth about whether that is the appropriate strategy or not. You are, quite frankly, adding a lot to the state of practice, if you will, through your experience. But it is still a work in progress. It works well in many cases, but again, it needs to be continually refined and updated.

Mr. GUTKNECHT. Dr. Meyer.

Dr. MEYER. Thank you, Congressman. I have had a fair amount of experience with ramp metering, both in my experience with the state DOT as well as through research efforts, and I think Dr. Walton is right: it really depends. And it is a—primarily a tradeoff. From my understanding of the Twin Cities' experiences, that the freeways themselves perhaps work a little bit better, but the people that we waiting a fairly substantial amount of time at the ramps themselves were not very happy. And this goes back to what I was saying before is that from a technical point of view, we know how to do ramp metering. There is no question about that. We know the technology. But it is the social behavior. It is the response. It is the public opinions of this and what are the tradeoffs and how do you evaluate that and how do you do the evaluation research in terms of these experiences elsewhere that really become very important. So an example in point, in Atlanta, we were looking at ramp metering. We did an analysis in one of our corridors, and we said, "Gosh, the freeway works a lot better, but we have one ramp where people are expected to wait, on average, 35 minutes to get on the freeway." And I said, "You have got to be out of your mind." You know,

people aren't going to do that, but the freeway works better. You don't understand. So we had this debate, and I think that is really what we are finding from the Twin Cities is that it works in some cases, but I really need to have a much bigger perspective.

Mr. GUTKNECHT. Well, I wish I could say that many of our constituents in Minnesota were happy to be those guinea pigs. I am not sure they really were. I am going to come back to another point, though, because as a Member of the Budget Committee, I have some pretty strong feelings about earmarking. And I want to really get—it was touched on before. I guess earmarking is good if it is a project that you are involved with, and I see my time has already expired. I am sorry, Mr. Chairman. Maybe I can come back to that later, but I do hope you will at least share your opinions at some point on the whole issue of earmarking because—well, I won't get into my editorial.

Thank you.

Chairman EHLERS. The gentleman's time has expired, but we will grant extra time for that. It is a very important issue. Congressman from Washington, Mr. Baird.

TRANSPORTATION RESEARCH INFORMATION SERVICE (TRIS)

Mr. BAIRD. I thank the Chairman and Ranking Member, and I compliment Mr. Gutknecht, who often asks such thoughtful questions. And it caused me to wonder, is there a clearinghouse for information of the sort Mr. Gutknecht asked? For example, if I am a local community and I want to ask, "Do I put a metered on-ramp?" or "What is the impact of HOV lanes?" or "How effective are roundabouts?" Is there a convenient place for state and local transportation planners to go to get some—most probable estimates of the effectiveness of an intervention?

Dr. WALTON. Yes, and as a matter of fact, the Transportation Research Board has something called TRIS, which is Transportation Research Information Service. It is supported by the U.S. DOT and others. It is supposed to be the depository for research activities that are underway. And it is a challenge, because, quite frankly, it is not funded at the level that it needs to be, you know, and as any clearinghouse, you have—it is only as good as the information that is provided and how current it might be. There are other groups within the DOT in their websites, they provide a variety of links to other programs and other activities, so yes, today, you can navigate through the Web and find a lot of information about that sort of thing. But clearly, in a recent conference we had on transportation research at the academies last week, the clearinghouse function came up again as an area where we have—sorely need more investment, not only for the data that Ms. Canby talked about and others, but also for information, lessons learned, or that kind.

SOCIAL FACTORS AND TRANSPORTATION CHOICES

Mr. BAIRD. I appreciate that. I am particularly interested in human factors and human decision-making. And distinguish the two. If you think—the human factors you are thinking of what kind of factors cause accidents, etcetera. Decisions, I am speaking more

of how far away from my workplace do I live? Because we have—and I serve on the Transportation Committee as well. And we have one of the secretaries show us a graph in which we saw a steady linear increase of demand for passenger capacity, a steady linear increase in demand for freight capacity, and a stable, almost flat level, capacity—potential for actual capacity increase. What kind of research do we have about how people make decisions that impact the transportation system? I know that—I believe earlier testimony from Ms. Canby or someone suggested that it is the second largest aspect of the family budget now. And when I look at people who say, “Well, I am, you know, 50 miles away from my work site, but look how cheap my house is,” what do we know about that and how we can influence that? Dr. Meyer.

Dr. MEYER. Congressman, we have been looking at that issue from a research point of view for several years, either in the context of land use models, which try to predict where land use is going to occur in the future, or land modeling in terms of trying to predict how people are going to—

Mr. BAIRD. I saw the graph in the back of your testimony. I thought it was interesting.

Dr. MEYER. Thank you. It is an interesting issue. And then some work, I think a lot more work is necessary. For example, I have been saying for the last several years, and I am looking for an opportunity to look at it, to examine it is that, based on my own experience, having two young kids and a family, that my household location and my tradeoff with transportation decisions has been directly related to the quality of schools. And I have moved three times in the last 10 years, and each time it is primarily because the kids went to the next level of school or we didn’t like the local school and therefore I moved. And my commute got 10 miles longer.

And so this whole issue of how one looks at the tradeoffs that households make in terms of not only the commute time and transportation, but also things like quality of schools or amenities or where jobs are locating in suburban areas certainly has been looked at. But I think a lot more effort really needs to be done, because that really, basically, is the driving force in terms of our transportation systems. In many ways, we are responding to millions and millions of individual decisions that are being made that I don’t think we know that much about at this point in time, although we certainly got the foot in the door.

Mr. BAIRD. I fully concur with that. It sounds like maybe we should take—I am actually serious about this. We should think about taking a portion of TEA-21 and investing it in quality schools and reduce the number of moves and commute miles.

Dr. MEYER. I want the record to show that I did not recommend that, because I am not recommending it. My colleagues would never talk to me again if I said that.

Mr. BAIRD. I am not recommending it, either, but it is the kind of question I am asking about where do we get the bang for our buck. We could spend umpteen million dollars on an “intelligent” transportation system, but having people making decisions, through their own intelligence, that render those rather meaningless. What do we know about—have there been any efforts to sort

of incentives people to move closer to their school or their work as ways of minimizing congestion, rather than putting down new concrete?

Ms. CANBY. Yes, Mr. Congressman. There—the—there is a program called the Location Efficient Mortgage that actually a member of my Board had championed. There is also a program that the Metropolitan Transportation Commission, the MPO for the San Francisco Bay area has put in place, again a housing incentive program where they have provided transportation funds to help people effect where they live, decisions. So there are beginning to be some issues in that regard. I think that this is a huge issue that needs a lot more examination. The whole issue of housing affordability, people forced to live further away, because they simply can't afford, on a nurse's salary or a teacher's salary or whatever, to live in the area where they happen to be working. And it puts a huge strain on families, and we need to understand it better.

Mr. BAIRD. On families and on the transportation system—

Ms. CANBY. Indeed, both.

Mr. BAIRD [continuing]. And we externalize that cost through gas tax or whatever. Could you make those studies available to me, Dr. Canby and Dr. Meyer, any—or others who are—

Ms. CANBY. Sure.

Mr. BAIRD [continuing]. Have relevant information?

Ms. CANBY. Happy to do so.

Mr. BAIRD. Thank you very much. Thank you, Mr. Chairman.

Chairman EHLERS. The gentleman's time is expired. Pleased to recognize Dr. Burgess.

MEETING THE GOALS OF ISTEA AND TEA-21

Dr. BURGESS. Thank you, Mr. Chairman. And I guess my question will be along the same line as Mr. Baird's in that our—the question I get over and over again back in my district is, "Are we getting our money's worth?" And specifically, after 10 years of investment through ISTEA and TEA-21, we don't know whether our transportation system and our R&D investments are meeting the goals of ISTEA and TEA-21. Do you, as a panel, have a recommendation as to what Congress should do to remedy this? And I am ready to take notes.

Mr. FRANKEL. If I might say, Congressman, that I think the nature of research, as you well know and as, indeed, comments have been made here by the Chairman and Members of this subcommittee indicate that it is difficult in this area, even in the case of the applied research, if you will, of the Department to assess the impacts, the rewards—the returns on investment, particularly in any short period of time. I think that one can say that there has been a substantial return on the investment in research that has been done by the Department of Transportation under TEA-21 and under ISTEA before it. One of the difficulties we have is we do face real issues, obviously, in particularly urbanized areas of congestion and mobility. And I know that my experience when I was in Connecticut, we invested a great deal of money in an ITS system for incident management in a very highly congested, one of the most congested stretches of highway in the state. And that grew out of research that was being done both by the Department—funded by

the Department as well as the private sector. And I could assess it as one responsible—that is it having a real difference, but unfortunately, the answer is that the situation would have been a lot worse for the users of the system if that investment had not been made. And going back to the research investment in incident management and ITS. That is not very satisfactory to users of the system or to your constituents just to say, “Boy, it is lousy, but let me tell you, it would be a lot worse but for this investment.”

I think much of that can be said. Certainly, the investment that has been made, for example, in safety and things related to safety, I think there had been and we will see increasing payoffs, I think, of—from that investment.

Dr. WALTON. Congressman, I think there have been enormous benefits associated with the program. In fact, there are lists of benefits that have been derived from the research and what the gains have been or what the economic return has done. And obviously, going back to the Frontiers of Science, the publication that created and help create the NSF, you recall that the more we know, the more we realize we don’t know. And it continues to go on. And the whole area of the transportation research enterprise, if we stand back and take a look at it, we would probably not create the model that we have in place right now. We would probably start again with a clean sheet of paper. And as we were discussing earlier, the notion of a strategic business plan or a strategic linkage between top down and bottom up might yield some more of a coordinated, integrated approach to our research enterprise. But quite frankly, the way—the benefits have been enormous. And it is surprising that—how well we have done, given the way in which the enterprise is organized today.

Dr. MEYER. Congressman, I completely agree with my colleague, Dr. Walton. And I think, too, from my own sense and the experience and the research results I have seen, there have been significant benefits. But one of the things that interests me, and it is in my written testimony, and I didn’t get the opportunity or chance to say it orally, is that it is funny that you can’t seem to find any evaluation of or written documentation relating what we are doing with our research dollars specifically to the goals that were established in ISTEA or in TEA-21, i.e., what are we doing in the areas of mobility, safety and security, economic vitality, system preservation, and environmental protection, which are goals that Congress established in terms of what this legislation was supposed to be doing. It is very difficult to show that linkage. And certainly what I would recommend in the context of, maybe, this strategic business plan that Dr. Walton is talking about, is to say, “Look, Congress has established these as national goals in terms of what our transportation system should be. And we are putting money on the table to do this. The least you can do is show us how your research results or how your transportation system investments are relating to those specific goals.” I should think that would be at least a minimum type of reporting that Congress would want to see.

Ms. CANBY. Congressman, in my statement, I suggest very much the same that Dr. Meyer is saying, that we should have some performance measures that are established against the principles of

the law, so that it gives, not only you, but us a chance to see how well we are doing.

Ms. SIGGERUD. Congressman, I wanted to point out that in our GAO report, we recommended involvement of a wide array of stakeholders in setting research agendas. And I think that that would be very responsive to the issues that you have raised about knowing more about the performance of the system. And by performance, I really think what you are focusing on there is what—how do the users experience the system as well as the performance of the concrete and that type of thing. Therefore, I would really urge that, as we move forward in this reauthorization that we try to institutionalize this concept of stakeholders. Involve not only traditional researchers but those that experience the system and those kinds of disciplines that interact with it on a regular basis. I would point to, for example, energy and land use, public health, those kinds of issues as well, and very important to be considered as well set our research agenda for the future.

COMMENTS ON F-SHRP

Chairman EHLERS. The gentleman's time has expired. We have sufficient time for a second round of questions, so I will begin the second round. And it is, in a sense, a follow-up to the previous question, in certain ways.

In your testimony, Dr. Walton, you describe the Future Strategic Highway Research Program, better known as F-SHRP, which is intended to fill critical short and medium-term research gaps. I assume—it is clear you support the proposal. I would like to just ask the other Members of the panel if they also are supportive of F-SHRP. We will start from Dr. Meyer this time.

Dr. MEYER. Well, given that I was a part of the process of coming up with F-SHRP, I am strongly supportive of the program.

Chairman EHLERS. Good.

Dr. MEYER. As I said earlier, I don't doubt at all that it is very valuable and very important. It is targeted on certain issues that, I think, are critical. But again, I think we need to look at some other things, but I am very supportive of F-SHRP.

Chairman EHLERS. Ms. Canby.

Ms. CANBY. Yes, I would also say that we are supportive of F-SHRP. We—one of my predecessors participated in the development of it. There are some issues that Dr. Walton and I haven't had a chance yet to discuss in particular, but on balance, it is an area that should be pursued.

Chairman EHLERS. Ms. Siggerud, based on your research, does it look like a good program?

Ms. SIGGERUD. Congressman Ehlers, we have not looked either at the past F-SHRP or the future F-SHRP, so I can't comment at this time.

Chairman EHLERS. Okay. Mr. Harm.

Mr. HARM. I would agree that—I mean, the F-SHRP is one where it is focused. It does touch on probably a lot of the issues that our constituents want, be it rebuilding our—renewal of our structure—infrastructure, the safety issues. It gets into the reliability of the users that we talked about earlier. So we would—I would be supportive of the F-SHRP program.

Chairman EHLERS. Mr. Frankel.

Mr. FRANKEL. Mr. Chairman, the Department is supportive of this program and its goals, which I think are complementary to many of the research efforts by the Department itself as well as various state agencies. The—much of it is—will come from, indirectly I suppose, from federal funds, that is from takedowns that pass through the states as a source of a substantial amount of the support for this program.

Chairman EHLERS. It is my understanding, and you can correct me if I am wrong, but I believe in the draft copies of the Administration's reauthorization proposal, F-SHRP is not included. Can I take your statement to mean that it is going to be included or is it still under discussion?

Mr. FRANKEL. Well, first of all, and just to be precise, what you have seen is the Department's proposals for the Administration's bill. There is no Administration bill as yet.

Chairman EHLERS. Yeah.

Mr. FRANKEL. And as I said, the money will, rather than be a specific appropriation, if I can put it that way, or direction of the F-SHRP program, the money would be funded by takedowns through state apportionments.

Chairman EHLERS. All right. So we can assume it is going to be in the final bill?

Mr. FRANKEL. Well, as I said, we are not recommending it specifically that there be a specific line item, if I can put it that way, for the program but rather the expectation—it is substantially federal money but drawn—passing, if I can put it that way, through the states, a draw-down from the states' apportionment of research funds.

Chairman EHLERS. Well, this is probably not the place to argue, but I will simply observe this may add to yet more convolution in the research programs of the Department. And I think the key is to—in terms of getting at a method of determining precisely what research should be done and evaluating how well it is going, the less confusion the better, so we will work with you on that point.

Mr. FRANKEL. Yeah. If I may say, Mr. Chairman, I think—I appreciate your concerns, but it is also true, and frankly, in terms of many of the interests that we have articulated, the panel has articulated and you have, Members of this subcommittee, that this program needs to have stakeholder engagement—partnerships. One of the key elements of research as it is true of, frankly, kind of a basic ethic of federal transportation under ISTEA and TEA-21 is a partnership with the Federal Government and the states. And that goes in the research area—that goes to the research area as well. And this program, which is a major initiative of AASHTO, which is an organization of state transportation organizations as well as TRB, much of the funding comes from the states. And I would say there needs to be buy-in in terms of the objectives of the F-SHRP program than any other research program. There needs to be buy-in on the part of state agencies, for example. They are, as you well know, the ones who own, operate, manage, maintain the transportation systems, certainly the highways and bridges and tunnels of this country. And the role of the Federal Government is primarily to fund and support them in that regard. And so in that

case, I think it is not inappropriate for the funding to flow in this way, in a partnership way.

Chairman EHLERS. Well, we obviously will have further discussions on that, but I would point out that in general, the research functions in almost every area are primarily a federal responsibility, because we have the broad overview. Obviously, in Florida and some other southern states, they are not very interested in the freeze/thaw cycle and what it does to highways. That is an immense interest in Michigan where I reside, because that is a major factor that causes our deterioration. My concern is just looking it as a researcher and how one manages this and in terms of stating over all objectives and trying to make sure the job gets done right. If the system is too bifurcated in the Federal Government, which provides a good share of the funding, if I can't ensure its objectives are met, then I think we have a major problem.

Well, my time has expired. Mr. Baird, do you have further questions?

HUMAN FACTORS, DECISION-MAKING, AND THE BUREAU OF TRANSPORTATION STATISTICS

Mr. BAIRD. I do. Thank you, Mr. Chairman, and I thank the panel for their illuminating comments earlier.

I want to follow on that theme a little bit about human decisions and human factors. It often seems to me that our transportation planning, by its nature, is skewed in two ways. One, we tend, I think, and I am not involved directly in it, but it seems like too often we neglect the end-use consumers. And the two types of consumers I most have in mind are the individual passengers driving their kids to school, shopping, whatever, and the business users, the people that are trying to get just-in-time delivery and just-in-time through-put. To what extent are they involved in the research endeavors that then lead to the transportation planning? And how can we do a better job of that?

Dr. WALTON. I will start that, Congressman. Excuse me. I think there is a notion of stakeholder involvement. This past couple of years at—through the Transportation Research Board with Federal Highway participating and incorporating, there was a national partnership forum that was created, looked at five thrust areas to try and assist in not only helping Federal Highway with their research agenda and proposals and development, but also the notion of F-SHRP and other research activities bringing stakeholders together, which covered the policy area through the hard—the more hard side, if you will, of pavements and aggregates and the like, bridge structures, and so forth. The extent was to explore how the stakeholder forums could be established and how they could be effectively integrated into the transportation planning process. We have learned a great deal from that exercise.

For the most part, the people who participated were those that were already engaged in some fashion in the enterprise or in the transportation community. However, there was a broad cross-section that included local governments, representatives, small business, and consultants of various kinds, so there was the beginning of that. And clearly, we have learned so much about community values and community input, but that is an ongoing, serious activ-

ity that we have yet to find the most effective mechanism for integrating that.

So I would say that there is an effort underway. This meeting that I mentioned last week at the TRB or the national academies was in an effort to try and begin the next stage, if you will, of that partnership with a variety of stakeholders and the emphasis on non-traditional stakeholders, if you will, the likes of whom you were mentioning.

Mr. BAIRD. Mr. Chairman, I just think it might be a good idea, as we draft our input into the TEA-3 or whatever we end up calling it, that we really emphasize this point about end use stakeholders and human decision-making processes having a critical role in this. Because the second part where I think there is a disconnect is I think there is also almost inevitably a time lag. It seems often what happens is a community comes to us and says, "Oh, my gosh. We have got tremendous congestion at 134th and I-5, therefore, we better build a ramp." And inevitably, you are going to be lagging 8 to 10 years behind the congestion, because you haven't planned: how is our transportation system and our school system and our manufacturing base and etcetera sending people—the tail is wagging the dog here, and it is wagging about 10 years late, and we are never going to make—we are not really going to have the kind of communities we want.

Ms. Canby.

Ms. CANBY. May I just add to what Dr. Walton said? While there has been a great effort to reach out, I think at the national level it is more difficult, because the non-traditional stakeholders are not always as well equipped to come to the national level to address issues. And secondly, it is very difficult to really get a handle, based on my experience, of what the end user, as you referred to them, very important, our customers, are experiencing every single day, even in a small state like mine of Delaware. It was very hard. We pushed and we got it, but hard to get a handle on what is really concerning people. I mean—so that is one of the reasons why I suggest thinking about creating a metropolitan planning and research program, because that will get closer to the people and their issues. And the further away you get, the harder it is to really address them and to close, as you suggest, the time lag between the problem and the solution.

Mr. BAIRD. Mr. Frankel.

Mr. FRANKEL. I might say, as well, Congressman, that there obviously is an important role here for statistics for the role of entities like the Bureau of Transportation Statistics. I don't mean that this is merely dry data, because we are dealing, as you said, with human factors, the kind of decisions we all make. As Dr. Meyer has indicated, we all have gone through those sorts of decisions. That is, indeed, what makes transportation so interesting, because it does influence all of those things. But we—the surveying process, as well as, you know, opening up the process, as Secretary Canby has said, and making sure that people have an opportunity to talk about it so that the planning process is more a bottom-up and not a top-down, which has been an issue, I might say, in the transportation field for a very long time. But to be able to draw it more broadly through the use of surveying and similar statistical infor-

mation gathered, the census itself, the Census Bureau gathers information, which is drawn on by the Bureau of Transportation Statistics. All of these agencies have to do a better job, I might say. And one of the things we hope to be recommending in the Administration's bill is a greater focus by BTS on doing, frankly, fewer things better and more focused on the real policy-making and decision-making process in transportation.

Mr. BAIRD. Yeah, I think that is helpful. If BTS is focusing predominately on X amount of road miles, X amount of fuel consumed, X amount of lag time, etcetera, we may be missing some much more critical elements on the lines of what Dr. Meyer was saying. I would be more interested in how many people move how often to where in order to get their kids in a better school. What is the average distance people live away from their workplace? What is the real cost in terms of the cost of housing with the externalized function of transportation? Those states, I think, might be more useful to us.

Thank you.

Chairman EHLERS. Ms. Siggerud, do you have a comment to add?

Ms. SIGGERUD. Yes, just one more comment to add. You asked about stakeholder involvement, Congressman Baird. And I just want to point out that our—in our review of the Federal Research—Highway Research Program last year, we found that it occurred but at a fairly—really at a research program level rather than a systematic level. In response to our report, and the report as well from Dr. Walton's committee, FHWA has an initial plan agreed to a more systematic approach and has also talked about involving a wider array of stakeholders as they implement that approach. And I think it is a useful area of continued oversight for the Subcommittee.

Chairman EHLERS. I thank you. And I just—on that issue, I was amused when we bought our first house some years ago. And I evaluated locations and compared cost. And I was very impressed that the public intuitively understands economics, because the economic balance that I observed between commuting and how pricy of housing was remarkably consistent with what one would expect.

I would like to follow-up on a comment you made, Mr. Frankel, a moment ago and the panel made earlier. There was general agreement, I take it from the testimony I heard, that the Bureau of Transportation Statistics is not living up to its mandate, its purpose, its goals. And Mr. Frankel, you indicated a desire to improve that. I am interested in what the rest of the panel would say about what is—anything should the Congress do to try to aid in that goal of strengthening the BTS and make sure that it lives up to its mandate for comprehensive, high-quality, independent, multimodal information. Dr. Walton, I see you smiling.

Dr. WALTON. We—Mr. Chairman, we certainly agree with that, and I would strongly support that as well. I like what Secretary Frankel was saying about what the Administration proposes for BTS. And I have not read that section of the bill on BTS, but I think we are all vitally interested in what the—what BTS's future is like. Clearly, I think that it perhaps has not met the goals that were intended for it, perhaps, and there may be a variety of reasons for that. But without the data and the information that that—

the vision within BTS that that was supposed to accomplish, we are at a severe disadvantage. The intent, of course, when that came into being, as you well, is that would provide the source of reliable data and information that would provide us the opportunity to do policy related research, to do quantitative research and be all predicated on high-quality information. That, unfortunately, has not emerged yet. And part of it may be funding. Part of may be the level of support for the enterprise. And part of it may be their—again the notion of a business plan for that in keeping with the Administration's objectives.

Chairman EHLERS. Anyone else? Ms. Canby.

Ms. CANBY. Let me just add to what Dr. Walton has said. BTS, it seems to me, to be successful, needs to be supported financially. I believe its appropriation has been flat through the entire authorization period, and maybe it makes sense to look at the allocation of resources within the Department so that BTS can get the support that it needs to do the job it has to do.

Chairman EHLERS. Dr. Meyer.

Dr. MEYER. Thank you, Mr. Chairman. I agree with what Dr. Walton and Ms. Canby say. I would note that there was a study that was done. I think it was subsequent to TEA-21 where Congress ask the Committee on National Statistics as well as the Transportation Research Board to look at BTS. I was a member of that panel. And there were all sorts of recommendations that came out of that, and a report was written. And I honestly don't know what, if anything, has happened from that. So I would recommend that certainly someone finds out how the recommendations have or have not been implemented as certainly a first step for dealing with that.

EARMARKING IN RESEARCH APPROPRIATIONS

Chairman EHLERS. And that is one of our concerns, and that is one issue we will be pursuing. Thank you. Anyone else on that? Just a few more questions, and then we will wrap it up. The one is one that Congressman Gutknecht referred to a little earlier, the earmarking issue. And I think that has been one of the problems that we have had in terms of managing the research. Just looking at the list, I asked the staff to prepare a list. This is not comprehensive, but I will skim through part of it. Infrastructure research, 74 percent earmarked. Infrastructure technology deployment, 92 percent earmarked. The total for infrastructure R&D, 81 percent earmarked. Environmental technology deployment, 100 percent earmarked. Operations technology deployment, 75 percent earmarked. Highway safety tech deployment, 100 percent earmarked. Now I recognize some of the—with deployment, the earmarking isn't quite as critical as on the research effort, but nevertheless you get—oh, I forgot ITS deployment, also 100 percent earmarked. The point is simply out of—if you look at all of the 386 million spent in fiscal year 2002 on FHWA research and deployment programs, 50 percent was earmarked.

Mr. Frankel, given that nearly 50 percent of the money is earmarked, how does that affect your ability and Department of Transportation's ability to develop and follow a strategic plan and

fund the highest value research? I would appreciate any comments or guidance you might have.

Mr. FRANKEL. Well, I am going to try to be very careful about answering that question, Mr. Chairman, because—

Chairman EHLERS. I—you will know that I was careful asking. All right. Let me add, I think there is a legitimate place for earmarking in some cases. This is a combination of authorization earmarks and appropriations earmarks. At its worst, it is pork. At its best, it is valuable direction from Congress, so I recognize there is a place for it, but it depends on the manner in which it is done frequently. Proceed.

Mr. FRANKEL. I guess I would say in the words I think I have heard attributed to appropriators, and I know some of the earmarking is done by authorizers as well, but it is a question of who establishes priorities. Suffice it to say that certainly I think in the deployment programs or pilot programs, so called, and if you think about them, particularly the deployment programs, one I am particularly familiar with, obviously, is ITS. And as you said, the deployment program is 100 percent earmarked. If you think about deployment programs or pilot programs as being extensions of research, the application on an experimental and demonstration basis, if you will, of research, then the Department is really not—in my opinion, not sufficiently engaged in the establishment of the priorities. The priorities increasingly, and it is a growing phenomenon as it is—you have given a photograph, but I think a movie over a period of time would show this growing even in the research budget. And it just means that the—whatever we may say in terms of strategies and so forth and trying to carry out the goals and purposes and missions contained in TEA-21, for example, that Congress is really substituting its judgment in many, many cases for how deployment money should be utilized and increasingly, I must say, research money. I leave to others whether that is appropriate from a public policy point of view.

It certainly is very constraining, because we would be—you know, we are asked questions by you and others—perfectly appropriately—are we meeting strategic goals, carrying out this mission, carrying out that mission, when in fact, the ability to invest the funds, in many, many cases, is constrained.

Chairman EHLERS. I thank you for a very adept and proper answer, but also a good answer. Dr. Meyer.

Dr. MEYER. Thank you, Mr. Chairman. I have two responses to your question. It is perhaps somewhat contradictory, but I am a firm believer in the peer review process in terms of the value of research. I mean, there is absolutely question in my mind that when you start earmarking research either for certain groups or certain individuals or certain companies or organizations, I think you are really stepping into the area of questioning the value of that research. So the peer review process, to me, has got to be a basic point of departure in terms of the type of research that we should be doing.

The only difference in that position, I guess, would be, to some extent, in the area of policy research, because I am also a firm believer that policy research should be relevant to policy-makers. And they should be—it should be dealing with the types of issues that

you are dealing with and you are likely are going to deal with in the future. So if the earmarking is saying, "We have a real problem in the area of aging and transportation. And we would like a study being done by the Transportation Research Board of that area," I don't have so much difficulty with that, simply because I think it needs to be relevant to your purposes. But to then go and say, "And by the way, University X should get it," I have real problems with that. I—a peer review really is the basic foundation for a valuable research program for the country.

Chairman EHLERS. Thank you for those comments, because that echoes my thought on it. I mentioned the freeze/thaw cycle earlier. It might be appropriate to earmark money for research on the freeze/thaw cycle, but if I also designate that it has to be done at the University of Michigan, then you get into—I think you negate the peer review process.

Ms. Canby.

Ms. CANBY. Very briefly, Mr. Chairman. I think you hit the balance very nicely in your comments. It strikes me that in the absence of an overall strategic vision is where we begin to get into trouble.

Chairman EHLERS. Yeah.

Ms. CANBY. And having that at least creates a framework around which people can identify the needs. And I think what Dr. Meyer said about the policy thing is very legitimate.

Chairman EHLERS. Well, I would respond by simply saying I think it is extremely important to have a good overall strategic vision. The difficulty you encounter is, in the political process, is the membership of Congress changes regularly, Committee Chairmen change regularly, but all the—on the other hand, the Administration faces the same problems that we do in the Congress. Someone is appointed, and after two years, they know their job, and after two more, they are gone, very frequently less time than that. And so it is very difficult to do that in the governmental process. But I am determined to do the best job we can on this subcommittee, and we will be happy to work with any and all of you on that effort.

THE STATUS OF STECRP

The last question, Mr. Frankel. TEA-21 authorized the Surface Transportation Environment Cooperative Research Program. After years of delay, DOT contracted with TRB to develop the Strategic Plan. The plan was published last fall, and once again, DOT has not requested any funding for STECRP. This is terrible, all these acronyms, STECRP in the fiscal year 2004 budget. Now the question is what is the problem. We authorized it five years ago, and nothing has happened. The basic problem is, as I just said, we authorized it five years ago, and nothing has happened, and the Congress does not look kindly on that.

Mr. FRANKEL. I appreciate that, Mr. Chairman. And actually, I would like to reserve the right to give you a more detailed response to that. But let me say, in general, as I understand it, this program has been implemented through TRB, but there have been difficulties in getting adequate and appropriate funding. But we will re-

spond to you in writing with a more detailed and thoughtful answer.

MATERIAL FOR THE RECORD

Question from Chairman Ehlers: What has the Department done to establish the Surface Transportation Environmental Cooperative Research Program, authorized in TEA-21?

Answer: The Federal Highway Administration (FHWA) began the implementation of a Surface Transportation Environmental Cooperative Research Program called for in section 5107 of TEA-21 by engaging the National Research Council to establish an Advisory Board in November 1999. The Advisory Board was asked to recommend a comprehensive agenda to address environmental and energy conservation research, technology development and technology transfer activities related to surface transportation. The Board's recommendation of an agenda for the cooperative research program was presented to FHWA in the Spring of 2002.

The Board recommended six critical areas of research for research in transportation and the environment: human health, ecology and natural systems, environmental and social justice, emerging technologies, land use, and planning and performance measures. While each of these areas is the subject of current research, the Advisory Board believes much more focused and coordinated research is needed in each area. To accomplish this, the Board further recommended that a new research program be formed to focus resources on critical issues that cannot be resolved effectively by parties whose interests are at stake. The recommended comprehensive research program would be a collaborative, cooperative research program that could be publicly and privately funded. The Board noted that full implementation should occur over several years after a careful start-up phase.

The Department of Transportation used the Board's recommendations in developing its surface transportation reauthorization proposals. The Administration's 2004 Budget request presented a comprehensive research budget that allows for flexibility. This flexibility is necessary as we develop more specific strategies for implementing the comprehensive, collaborative, and cooperative research program recommended by the Board.

Chairman EHLERS. We will welcome that response. And with that, we will conclude the questions. And I certainly want to thank you for being here. You have been an outstanding panel, extremely helpful to us in our process of coming to a conclusion of what to try to incorporate in the bill. And of course, we will have to work with the Transportation Infrastructure Committee as well, because they are also going to have their concerns and their priorities. But we certainly hope they will listen to us on the research aspects, because that is our field of expertise.

Thank you very, very much for being here.

Mr. FRANKEL. Thank you, Mr. Chairman.

Dr. MEYER. Thank you.

Chairman EHLERS. The hearing is adjourned.

[Whereupon, at 11:50 a.m., the Subcommittee was adjourned.]

Appendix 1:

BIOGRAPHIES, FINANCIAL DISCLOSURES, AND ANSWERS TO POST-
HEARING QUESTIONS

BIOGRAPHY FOR EMIL H. FRANKEL

Emil Frankel was appointed Assistant Secretary for Transportation Policy of the United States Department of Transportation in March of 2002. From 1991 to 1995, he served as Commissioner of the Connecticut Department of Transportation. He was Chairman of the Standing Committee on the Environment of the American Association of State Highway and Transportation Officials (AASHTO) and Vice Chairman of the I-95 Corridor Coalition. He has served as a speaker, panelist, and moderator on a wide range of transportation topics including Intelligent Transportation Systems (ITS) technologies, intercity rail services, transportation planning and management, and transportation and air quality. He is a graduate of Wesleyan University, where he served as a Trustee from 1981 to 1997. From 1995 to 2001, Mr. Frankel was a Management Fellow of the Yale School of Management and a Senior Fellow of the Yale School of Forestry and Environmental Studies, where he was engaged in teaching, research and writing on issues of transportation policy, transportation and the environment, and public management. In 2000 he was an Adjunct Professor at the University of Connecticut, where he taught transportation policy.

Mr. Frankel was a Fulbright Scholar at Manchester University in the United Kingdom and received his law degree from Harvard Law School.



**U.S. Department of
Transportation**
Office of the Secretary
of Transportation

Assistant Secretary

400 Seventh St., S.W.
Washington, D.C. 20590

July 11, 2003

The Honorable Vernon J. Ehlers
Chairman, Environment, Technology
and Standards Subcommittee
Committee on Science
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

It was a pleasure to testify before your Subcommittee on the subject of the Department of Transportation's research and technology program under TEA-21 and our proposals for funding research and technology in FY 2004.

At the time, I was not able to describe the full breadth of the Administration's research and technology proposals for the next six years. On May 14, Secretary Mineta unveiled the Bush Administration's six-year \$247 billion surface transportation reauthorization proposal--the Safe, Accountable, Flexible and Efficient Transportation Equity Act of 2003 (SAFETEA)--which will be the largest highway, public transportation and safety investment in United States history. Our proposal contains important innovations in research and technology that we believe will lead to more successful innovation and implementation of innovation.

I am enclosing answers to the most recent set of questions for the record that you forwarded to me on June 12.

Thank you for the opportunity to testify at your hearing and I am prepared to answer any additional questions you or your Subcommittee might have.

Sincerely,

Emil H. Frankel
Assistant Secretary for Transportation Policy

Enclosure

ANSWERS TO POST-HEARING QUESTIONS

Responses by Emil H. Frankel, Assistant Secretary for Transportation Policy, U.S. Department of Transportation

Questions submitted by Democratic Members

Q1. Why did the Department decide not to renew the contract with ITS America to serve as advisory committee for the ITS program? What plans does the Department have to obtain stakeholder input to the research and deployment plan for this program?

A1. ITS America has played an important role in the many successes in the formation and maturation of the ITS Program. As the program transitions to a new phase, it was time to transition to a new mechanism for receiving stakeholder input. The Department will get external advice regarding ITS initiatives from a new Federal Advisory Committee that is being established and will be managed by the ITS Joint Program Office. This tested method of consultation serves the Department well in other program areas, and the new ITS Advisory Committee will give the Department direct stakeholder input to the research and deployment plan for the ITS Program. The new DOT advisory committee will be organized and chartered under the Federal Advisory Committee Act (FACA). Organizations with resources and expertise to offer meaningful advice will be invited to serve. We expect the new DOT advisory committee to convene its first meeting this fall.

This step does not mark an end to our relationship with ITS America, rather there will be appropriate evolution. The Department expects to have a close and important ongoing relationship with ITS America. We value the contribution that ITS America has made to the Department over the past 10 years. The Department will continue to work closely with ITS America, as it does with other transportation organizations. In the future we expect to focus on and provide funding for very specific tasks for which ITS America is uniquely suited.

Q2. Mr. Frankel, at the beginning of your testimony you said developing a new device or new way of operating is only a part of the task of developing a new technology. You believe the hardest challenge is finding a way to encourage those changes to be adopted by users and operators of the systems. You also indicated the Department needs to find ways to move technologies into the transportation system faster and encourage its stakeholders to accept new approaches to doing business. This is a very important point. However, in the rest of your testimony you did not describe specific actions the Department will take to address the problem you identify. Please describe the actions the Department plans to take to address these technology transfer issues. Also, please provide us some past examples where Transportation technologies have been developed, but not adopted by the user community?

A2. As I indicated in my testimony, the implementation of technology is a critical component of effectively developing a new technology. The Department makes a concerted effort to find ways to move these technologies into the transportation system faster and encourage its stakeholders to accept new approaches to doing business. The FHWA *Corporate Master Plan for Research and Deployment of Technology and Innovation*, for example, explicitly recognizes our major responsibility in developing, deploying, and implementing transportation innovations, and describes how it shares roles with its stakeholders and partners in the public and private sectors, academia, and the international community. Other DOT agencies have similar strategic planning documents. These plans outline the activities that encompass the technology transfer function needed for new technologies.

Professional capacity building activities have a prominent place throughout the Department's research program. Depending on the subject matter, the activities include workshops, certification courses, and other type of training that are offered to transportation professionals in State Departments of Transportation, local governments, transit properties and other stakeholders and partners. As one example, the DOT ITS Joint Program Office has developed over 25 different courses related to ITS and have taught these courses to thousands of students from Federal, state and local government as well as the private sector. They also offer technical assistance to state and local officials in the development, design, deployment and operation of intelligent transportation systems.

Another activity that serves this function are field tests of new concepts and technologies and so-called "showcase projects" that are intended to demonstrate the real-world effectiveness of new technologies and new operating approaches. NHTSA is

a key partner with the ITS Joint Program Office in the use of field operational tests as a means of evaluating vehicle-based safety-enhancing systems. Vehicle manufacturers have repeatedly supported these tests as a means of encouraging development of effective safety-enhancing systems. Also, FTA has been working with the transit industry to develop a Research and Technology Five-Year Business Plan that identifies research and technology priorities. A significant part of this program is a Joint Partnership Program (JPP) for Deployment. This program helps to implement transit research through the selection of needs-driven innovations. Consortium members provide a minimum of 50 percent of the costs, serving as an incentive for deployment and allowing for retention of patent and intellectual property rights. Program participation is based on a competitive selection process, including industry participation in research topic selection.

Another important activity supporting the use of technology and innovation is the development and dissemination of reference materials such as specifications, design guides, manuals, CD-ROMs, material for training courses, websites, and software.

Finally, communications outreach is a part of this technology transfer process. The Department participates in professional meetings, conventions, and the like in order to highlight the advances that are being made available to the transportation community. These information-sharing activities promote awareness of particular new technologies or innovative practices within the transportation community.

Q3. Mr. Frankel, in your testimony, you focus on the outputs of DOT's transportation research program—the amount of funds spent, the number of projects funded, or the number of reports issued. There is no mention of the outcome of these activities. How have the technologies or practices evaluated in transportation research projects reduced congestion, improved decision-making, improved traffic safety, and improved the environment? Please provide some examples of outcome assessment of DOT's projects and an assessment of DOT's research and development program based upon an outcome analysis.

A3. The research program sponsored by the Department supports the achievement of all the Department's Strategic Goals—safety, mobility, global connectivity, improvements to the environment, and national security. The projects undertaken have provided substantial benefits and have yielded substantive advances and innovations that have contributed to improvements in all aspects of the transportation system, including longer lasting pavements for highways and airports, structurally sound bridges, advanced highway traffic systems, improvements to the air navigation system, and improvements in the operational efficiency of transit operations. These improvements save lives, time, and money.

The specific benefits for the Department's projects have been well documented in numerous reports, studies and budget submissions. One example of a systematic collection of benefit-cost information is in the Department's Intelligent Transportation Systems program. Since December of 1994, the ITS Joint Program Office has been actively collecting information regarding the impact of ITS projects on the operation of the surface transportation network. Data collected under this effort are available in the ITS Benefits Database which is made available through the DOT ITS website. There is also a one page desk reference available on the same website that summarizes data in the Benefits Database. The ITS JPO also collects information on ITS costs, and maintains this information in the ITS Unit Costs Database. The database is a central site for estimates of ITS costs data that can be used for policy analyses and benefit/cost analyses.

An example of formal reviews of the impact is an analysis by FHWA that the use of incident management programs has typically reduced delay associated with congestion caused by traffic incidents by 10 to 45 percent in the places they have been implemented. Another example is the finding that the use of highway pavement preservation techniques reduce the amount of water infiltrating the pavement structure, slow the rate of deterioration, or correct surface deficiencies such as roughness, leading to a five- to ten-year increase in the life of a structurally sound pavement.

Research conducted by FHWA has led to the almost universal use of epoxy-coated reinforcing steel for corrosion protection of concrete bridges. The deployment of this material has resulted in longer-lasting bridges that have saved hundreds of millions of dollars.

Each year, State and local governments spend more than \$100 million on noise walls and other noise mitigation methods. As a result of FHWA investment of just \$3.9 million over nine years in research to improve noise models, it is estimated that State and local governments will be able to save more than \$19 million annually in noise mitigation construction costs.

Similar results exist for the research of each of the operating administrations as their programs support the missions of each agency.

Question submitted by Chairman Ehlers

Q1. What has the Department done to establish the Surface Transportation Environmental Cooperative Research Program, authorized in TEA-21?

Answer 1. The Federal Highway Administration (FHWA) began the implementation of a Surface Transportation Environmental Cooperative Research Program called for in section 5107 of TEA-21 by engaging the National Research Council to establish an Advisory Board in November 1999. The Advisory Board was asked to recommend a comprehensive agenda to address environmental and energy conservation research, technology development and technology transfer activities related to surface transportation. The Board's recommendation of an agenda for the cooperative research program was presented to FHWA in the Spring of 2002.

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The Department of Transportation used the Board's recommendations in developing its surface transportation reauthorization proposals. The Administration's 2004 Budget request presented a comprehensive research budget that allows for flexibility. This flexibility is necessary as we develop more specific strategies for implementing the comprehensive, collaborative, and cooperative research program recommended by the Board.

BIOGRAPHY FOR ERIC E. HARM

Deputy Director, Division of Highways, Illinois Department of Transportation

1979—BS, Civil Engineering, University of Illinois, Urbana

1980—MS, Civil Engineering, University of California, Berkeley

1980—Began employment with the Illinois Department of Transportation (IDOT)

1985–1998—Engineer of Physical Research, IDOT

1998–2002—Engineer of Materials and Physical Research, IDOT

Dec. 2002—Promoted to Deputy Director of Highways, Project Implementation

As Deputy Director of Highways, responsible for:

- Direction and coordination of the Division of Highways' central bureau construction, materials testing, physical research activities and the coordination of local agency federal and local motor fuel tax programs.
- Oversee development of technical policies, procedures, and standards for program implementation activities.
- Ensure liaison among industry organizations to provide forums for discussion of mutual concerns.

Registered Professional Engineer—Illinois



Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

April 9, 2003

Vernon Ehlers, Chairman
Subcommittee on Environment, Technology, and Standards
House Committee on Science
2320 Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Ehlers:

The State of Illinois receives on average between \$10 million and \$12 million annually in SPR Funds from the Federal Highway Administration for planning and research purposes.

Sincerely,

A handwritten signature in black ink, appearing to read 'Eric Harm'.

Eric Harm
Deputy Director of Highways

ANSWERS TO POST-HEARING QUESTIONS

Responses by Eric E. Harm, P.E., Deputy Director, Division of Highways, Illinois Department of Transportation

Questions submitted by Democratic Members

Q1. You indicated during the hearing that funds for transportation research should be increased. How large an increase would be appropriate (e.g., 5 percent, 10 percent)? Should some of the increase come through a re-direction of funding for other transportation needs? If so, from which areas should the funding be re-directed?

A1. Depending on how one looks at increased funding, the percentage increase could be as high as 100 percent. Transportation research has been historically under funded. Only one-half of one percent of highway spending is allocated for research. This is less than practically any other industry. For example, the medical device industry and electronics industry spends 12 percent and 7 percent respectively on research.

From the standpoint of practicality in terms of available research capacity to perform transportation-related research, some of the areas that need increases in research emphasis include: environmental, regional planning, economic impacts, financing transportation projects, road/highway intermodal impacts, controlled growth, and contact sensitive design processes and procedures. A 20–25 percent increase is reasonable and more importantly is deliverable.

Ideally, the increase should come from increased funding and not taken away from existing funded transportation needs. Research should be looked at as an investment in addressing transportation needs and finding economical solutions and should be a part of all transportation modal programs. As such, if funds have to be redirected, it should be accomplished within each ongoing program. For example, transit research funding should come from within the funded transit programs, not highways or airport-funded programs.

Q2. Please describe the characteristics of the employees of the state DOT and of the metropolitan planning organizations throughout your state. How many employees are in these organizations? What are their educational backgrounds? Does the Department hire primarily people with advanced degrees (Masters and Ph.D.s) or primarily people with Bachelor and Associate degrees? How has the set of needed skills changed over the past decade or so, if at all? If you could design a curriculum to train future employees of the state DOT or the metropolitan planning organizations, what skills would you consider to be of greatest value?

A2. Illinois has 14 Metropolitan Planning Organizations that vary greatly in their levels of expertise and need. From our smallest areas with a staff of two to the Chicago MPO with a staff approaching 50 employees, skill levels are diverse. As a general rule, even our smallest MPOs have staff with advanced degrees. Nearly all management staff at mid-size and large MPOs have advanced degrees with entry personnel having a minimum of a Bachelor's degree. Many, if not most, MPO employees' degrees are in urban planning or a related field.

The skill needs have certainly changed over the years. MPO staffs still need basic planning and technical demand modeling, traffic analysis and cost-benefit analysis, but much of the role of the MPO has become working with the public and local officials. Planners would be well served with a curriculum that includes public speaking, public administration, government financing, project management and marketing. Not to underestimate the need for technical skills, but a more diverse set of skills would assist MPOs in explaining how transportation decisions are made and reducing the image of a technical black box from which answers magically appear.

Q3. What measures has the Illinois DOT used to evaluate the extent to which the Gateway Traveler Information System is used by commercial transportation operators and individual citizens? How has the implementation of this system reduced congestion and how have you measured changes in congestion that resulted from the implementation of this system?

A3. The Gateway Traveler Information System (Gateway) has been conceived, designed, deployed, and operated as a means to share real-time traffic and transit information amongst the many transportation operators serving the three state, sixteen county Gary-Chicago-Milwaukee (GCM) Corridor. Gateway also provides this

high quality, current information to users of the system including individual travelers and commercial transportation operators.

The premise is that better, multi-jurisdictional, and multi-modal real-time information will support more effective operations, more coordination across systems, and improved decision-making by transportation users. While Gateway is deployed it should be recognized that there are many more data sources and users still to be connected to the system to meet its ultimate design goals. Gateway currently receives data from seven major sources.

One product of the Gateway is the *www.gcmtravel.com* website that provides the real-time information to private sector information service providers (ISPs), commercial transportation operators, and the general public. Another product is the capacity for commercial information services (such as ISPs and mass/broadcast media) to directly connect to the Gateway system and, by so doing, to have access to the Gateway real-time information.

The new Gateway website and system was launched in November 2002. The Gateway expands the long-standing model of traffic information in the Chicago area whereby the Illinois DOT has collected, verified, processed, and distributed real-time traffic information to private sector partners for their redistribution to the broadest possible user base through mass-media broadcast (television and radio) and specialized commercial information services. This has proven to be a very effective and efficient partnership to get the information to the end user quickly for more than forty years.

One measure of the success and impact of the Gateway system is the number of commercial information services that use and rely on the Gateway for their real-time traffic information, and the regular (every ten minutes) updates that commuters receive on traffic conditions through nearly every media in the

Chicago area and throughout the GCM Corridor. There are currently eight principal commercial users registered to receive data from the Gateway either through the Internet interface or through a direct connection to the Gateway system. Recently new commercial information services have used the Gateway website to provide traffic data directly to users through cellular phones and personal digital assistants (PDA's). Several additional requests for connection to the Gateway system are being considered. Many other users have Internet links to the Gateway website. These applications, along with emerging in-vehicle technologies will rely on the Gateway as the single, integrated source of real-time traffic information in the GCM Corridor.

Another measure of the success of the Gateway system is obtained by comparison with its peers (i.e., other traveler information systems). In 2002, after a comparison of the Gateway website with 215 comparable traveler information systems, USDOT gave the Gateway its "Best Traveler Information Website" award based on the content and ease of use. In 2003 the Intelligent Transportation Society of America (ITS America) gave the *www.gcmtravel.com* website its "Best of ITS" award in the consumer product category over three other finalists in that category.

A more direct measure of the value of the Gateway website is the number of hits (users). In the most recent four month period (March 2003 through June 2003), the *www.gcmtravel.com* website has averaged over 3.3 million "hits" per month for a total of over 13.3 million hits during this period. (Go to <http://www.gcmtravel.org/stats/index.html> for Gateway usage statistics). Use of the Gateway website increased dramatically when the coverage was expanded to include real-time traffic information on the Illinois Tollway system to supplement the information on Chicago, Milwaukee, and Gary expressways.

Studies of similar systems have indicated that over 80 percent of travelers receiving specific route information changed their travel behavior (from San Francisco/Bay Area TravInfo data). Such behavior by users indicates that they are experiencing less congestion on the alternative routes they selected due, in part, to the availability of real-time traffic information.

Another indicator of Gateway system performance is the large number of informal comments received from users including their evaluation of the services and their suggestions for improvements. The utility of the website is confirmed by the numerous inquiries received on the rare occasions when the system is unavailable due to communication or other lapses in service or reduced functions due to routine maintenance.

As the Gateway system completes its final acceptance testing, Illinois DOT anticipates using more formal methods such as user surveys, focus groups, and statistical analysis of archived data to evaluate the performance of the Gateway and its impact on congestion, traveler behavior, and system operations.

BIOGRAPHY FOR C. MICHAEL WALTON

Dr. C. Michael Walton is Professor of Civil Engineering and holds the Ernest H. Cockrell Centennial Chair in Engineering at the University of Texas at Austin (UT). In addition, he holds a joint academic appointment in the Lyndon B. Johnson School of Public Affairs.

Dr. Walton, a native of Hampton, Virginia, earned a B.S. degree in civil engineering from the Virginia Military Institute in 1963. Following four years of military service as a Captain in the U.S. Army Corps of Engineers, he returned to academia to earn a Master's degree and a Ph.D. degree in 1969 and 1971 respectively from North Carolina State University, both in civil engineering. During this period he served in the Office of the Secretary, U.S. Department of Transportation in Washington and with the North Carolina State Highway Commission. In 1971 he joined the UT Austin faculty, pursuing a career in transport policy and engineering analysis that now spans more than 30 years.

Dr. Walton is a member of the National Academy of Engineering. He is a past-chair of the Transportation Research Board (TRB) Executive Committee and the western region vice chairman of the American Road and Transportation Builders Association (ARTBA). He is a founding member of the Intelligent Transportation Society (ITS) of America and currently serves as chair on the Board of Directors. He is a Fellow of the American Society of Civil Engineers and the Institute of Transportation Engineers. He also holds many other positions within the transportation profession's technical societies and industrial boards such as serving as secretary and member on the Board of Directors of the International Road Federation (IRF) and president of the Board of the International Road Educational Foundation. He has served on or chaired a number of national study panels, including those mandated by Congress and others by the National Research Council (NRC). He is chair of TRB's Committee for the Congressional Study for a Future Strategic Highway Research Program and the Research and Technology Coordinating Committee (FHWA). Other professional or technical society memberships include American Society for Engineering Education, Institute for Operations Research and the Management Sciences, National Society of Professional Engineers, Society of American Military Engineers, Society of Automotive Engineers, and the Urban Land Institute.

Dr. Walton is the recent recipient of the 2000 George S. Bartlett Award in recognition for outstanding contributions to highway progress. He was selected by a Board of Award comprised of the President and Executive Director of each of the three sponsoring organizations—American Association of State Highway and Transportation Officials (AASHTO), TRB and ARTBA. The Bartlett Award is unusual in that it is the only award jointly sponsored by the three organizations and is considered to be among the highest honors in the highway transportation profession. The American Society of Civil Engineers noted the technical contributions of Dr. Walton by honoring him with several awards including the 1999 Francis C. Turner Lecture for contributions to transportation research, education and practice, the 1992 James Laurie Prize for contributions to the advancement of transportation engineering; the 1987 Harland Bartholomew Award for contributions to the enhancement of the civil engineer's role in urban planning and development; and the 1987 Frank M. Masters Transportation Engineering Award, for innovations in transport facility planning. The Transportation Research Board presented Dr. Walton with the 1998 W.N. Carey, Jr. Distinguished Service Award in recognition of outstanding leadership in support of transportation research. In 1995, he was named TRB's Distinguished Lecturer in recognition of the research contributions over his entire career. The American Road and Transportation Builders Association presented Dr. Walton with the 1994 S.S. Steinberg Award recognizing his outstanding contributions to transportation education. He received the 1995 Distinguished Engineering Alumnus Award from the College of Engineering at North Carolina State University. The College of Engineering at The University of Texas at Austin awarded Dr. Walton the 1996 Joe J. King Award, their highest professional award, in recognition of his outstanding leadership to the engineering profession. The Institute of Transportation Engineers has awarded him the 1996 Wilbur S. Smith Distinguished Transportation Educator Award in recognition of outstanding contributions to the transportation profession by relating academic studies to the actual practice of transportation.

Dr. Walton has contributed to more than 200 publications in the areas of ITS, freight transport, and transportation engineering, planning, policy and economics, and he has delivered several hundred technical presentations. He has served as senior editor or contributing author for a variety of technical reference books and manuals and as a member of the editorial board for several international journals.

COMMITTEE ON SCIENCE
Witness Disclosure Requirement - "Truth in Testimony"
Required by House Rule XI, Clause 2(g)


1. Name: C. Michael Walton	2. Address: (office) The University of Texas at Austin Department of Civil Engineering 1 University Station C1761 Austin, TX 78712
3. Phone Number: 512-471-1414	

4. Please identify the group(s) or organization(s) on whose behalf you are testifying. If you are not testifying on behalf of any group or organization, please indicate "none". <p style="text-align: center;">none</p>
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5. Are you testifying on behalf of a governmental organization, meaning a federal department or agency, or a state or local department, agency, jurisdiction? <small>(If "yes" skip to item 7.)</small>	Yes	No X
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6a. Have you, or any of the organizations or groups which you may be representing, received any federal grants or contracts including subgrants or subcontracts) that are relevant to the subject of the hearing during the current fiscal year or any of the two (2) preceding fiscal years?	Yes X	No
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6b. If you checked "yes" for item 6a above, please list the source and amount for each grant, contract, subgrant, or subcontract, received within that period. Please attach additional sheets if necessary.	
Source	Amount
Individual Research Contracts from USDOT and TxDOT	FY 03 - \$369K
	FY 02 - \$292K
	FY 01 - \$302K

7. Please sign and date indicating that to the best of your knowledge the information provided on this form is both true and accurate.	
Signature: 	Date: 4/8/03

ANSWERS TO POST-HEARING QUESTIONS

Responses by C. Michael Walton, Ernest H. Cockrell Centennial Chair, University of Texas–Austin, Department of Civil Engineering

Questions submitted by Democratic Members

Q1. You indicated at the hearing that funds for transportation research should be increased. How large an increase would be appropriate (e.g., 5 percent, 10 percent)? Should some of the increase come through a re-direction of funding for other transportation needs? If so, from which areas should the funding be re-directed?

A1. The Transportation & Infrastructure Committee has proposed authorizing \$375 billion over six years for surface transportation. This would represent a substantial increase in transportation funding over the \$218 billion authorized for surface transportation programs in TEA–21. Growth of transportation research funding should reflect the growth of the overall program, demonstrating the Congress’s continued support for research priorities. In this scenario, the increase in funding need not come from the redirection of funding from other transportation needs; rather, any increase in funding should simply be directly proportional to the increase in the authorized funding levels for highways, transit, highway safety, and other programs.

In the event that overall program funding does not grow substantially, a healthy increase in research funding of at least 25 percent to 33 percent is still warranted to address national transportation needs, such as increasing highway fatalities, increasing congestion, and the imperative to minimize environmental impacts and maximize the economic benefits of transportation. Since the benefits of national level research would support all facets of the surface transportation program, the increase in research funding could be supported through redirecting funds proportionally from the major surface transportation program areas.

Q2. Vehicle miles traveled have increased at a rate much greater than the increase in licensed drivers. So, each driver is making more trips and driving more miles contributing to the increased congestion on our roadways. Yet, you do not mention any research in the F–SHRP program to examine the causes of this increased travel demand. Also, your description of the F–SHRP program places all emphasis on highways. The highway system is embedded in a larger transportation system involving secondary roads, airports, long-distance passenger and freight rail, and transit yet the program you describe appears to ignore the rest of the transportation system. What happened to intermodal considerations in the research agenda?

A2. In TEA–21, Congress specified a strategic “highway” research program, so the original F–SHRP committee developed the proposed program around highways. Nevertheless, the Committee recognized the important point in this question—that the highway system is part of a much larger system, involving other transportation modes as well as the economy, communities, and the environment. The Capacity area of F–SHRP explicitly casts the problem of highway capacity in this larger context. In this portion of F–SHRP, there is research oriented toward travel demand and the relationship of highways to local and regional economies (which includes the role of freight transportation). The major products envisioned by the Capacity research—a decision screening process and a “workstation” that includes analysis and design tools—include consideration of non-highway and non-construction alternatives to building new highway capacity to meet increasing demand. In addition, the Renewal portion of F–SHRP will consider both the impacts of highway renewal on rail and transit and the role of transit in absorbing demand during (and potentially after) renewal projects. While F–SHRP was not intended to be an “intermodal” research program, we believe that we have integrated other modes where appropriate. The scale and complexity of F–SHRP makes it difficult to represent the program comprehensively in a short testimony. Your staff has recently been provided with the current version of the detailed research plans for the program and the F–SHRP Oversight Committee is actively working on developing more accessible summaries of the plans (which total more than 700 pages).

Q3. How does the make-up of the stakeholder group organized to develop the F–SHRP agenda differ from the stakeholder group that advises and directs the research agenda of the Highway Cooperative Research Program administered through the Transportation Research Board? If the Transportation Research Board’s research agenda receives input from the stakeholder community and the stakeholder community feels these areas of research are a priority, why hasn’t

the Highway Cooperative Research Program provided funding in these areas? How do we reconcile the recommendation of the F-SHRP committee to have this program administered separately from existing programs with the recommendation that the Transportation Research Board administer the program? Why would TRB administer this program better/differently than it administers the cooperative research programs?

A3. The National Cooperative Highway Research Program (NCHRP) is the research program of the Association of State Highway and Transportation Officials (AASHTO) and is administered by TRB at the request of AASHTO. The stakeholder group that programs and guides NCHRP is an AASHTO committee composed entirely of executives and research managers from the state departments of transportation. NCHRP conducts research on questions that face a large number of state DOTs and which can be solved through individual projects in a relatively short (1–2 years) timeframe. F-SHRP, on the other hand, has been guided by a number of stakeholder groups (committees and panels) comprising not only representatives of State DOTs, but also local governments, federal agencies, the private sector, universities, and various interest groups. In addition to the formal committees and panels, stakeholder input has been sought from other organizations through workshops, focus groups, mailings, and an interactive web site. The resulting research areas reflect not only the priorities of the state DOTs, but priorities that are shared by a wider spectrum of stakeholders. The research in F-SHRP is larger in scale and scope than that of NCHRP and requires a higher degree of coordination among the projects themselves. Although some shorter-term results are expected, the overall goals of F-SHRP require a focused effort of 6 or more years, in contrast to the shorter timeframe of NCHRP. F-SHRP also required more than twice the annual NCHRP budget, so NCHRP could never fund work at this scale. In fact, TRB's successful administration of NCHRP, along with the successful administration of the first SHRP through a special unit of the National Research Council (NRC)—which was basically a sister unit to TRB—has strongly influenced the desire of stakeholders to have F-SHRP administered through NRC/TRB.

Q4. Dr. Walton, under the research category of “reliable travel times” you list several items that have been the focus of ITS research and safety research for a number of years now—decreasing response times to traffic incidents and preventing non-recurring incidents. How is the research envisioned under the F-SHRP program different from the ongoing work in this area in the safety and ITS programs?

A4. The Reliability and Safety areas of F-SHRP are closely related to programs conducted through the ITS Joint Program Office (JPO); however, the F-SHRP research in each case has a distinct objective and distinct research tasks and methods, which are described below:

- In the Reliability area, F-SHRP plans to develop implementable strategies for addressing a wide range of causes of congestion or, more specifically, travel time unreliability. F-SHRP includes both research to gain more fundamental knowledge about travel time reliability and development of new technologies, areas that FHWA does not often fund. The Reliability research plan also stresses the fuller context in which particular technologies and methods must be implemented, including institutional issues, human behavior, data needs, performance measurement, analytical methods, and design and traffic management procedures. Even where F-SHRP projects have a strong applied focus and could conceivably be funded as FHWA projects, F-SHRP offers the opportunity to significantly increase and concentrate research resources on high pay-off topics. The research plan has been discussed with FHWA staff to avoid possible overlap; as a result, several originally proposed projects were eliminated and an entire topic (related to weather) was re-designed. In addition, F-SHRP has a strong emphasis on implementation, which because of limited funding FHWA is unable to focus on as much.
- In the Safety area, the main body of the research is aimed at gaining fundamental knowledge about driver risk-taking behavior in order to develop fundamentally improved safety countermeasures. The ITS Intelligent Vehicle Initiative (IVI) program is currently conducting a “naturalistic driving” study, which is testing the feasibility of using advanced technologies to study driver behavior. This study is intended to be a pilot for a larger-scale study that will ultimately support the implementation of safety-related ITS technologies (such as collision avoidance technologies). While the larger-scale IVI study and the F-SHRP study may use similar data gathering technologies and methods (in fact, the current naturalistic driving study is effectively a pilot study for F-SHRP also), the two studies have different goals, will collect dif-

ferent data, and will perform different analyses. The IVI study is expected to focus more on driver behavior in general and is interested in data and analyses that support the implementation of ITS technologies. The F-SHRP study is interested in behaviors associated with particular crash types but is interested in analyses that could lead to a variety of potential countermeasures, whether “high-tech” or “low-tech,” involving vehicle, infrastructure, driver, or enforcement. In addition, part of the F-SHRP study involves instrumenting intersections, rather than vehicles, something which is not part of the IVI study. F-SHRP will also be developing methodologies for the use of advanced technologies in safety research, including methods for data gathering, access, storage, analysis, and management. These methods do not currently exist. A segment of the F-SHRP safety program will also involve rigorously scientific evaluation of selected existing safety countermeasures. If both programs are funded, they will work together wherever appropriate (the NHTSA managers of the relevant ITS projects are involved with the F-SHRP planning effort). For example, if they use a common data format, they could share relevant data, which would effectively increase the sample size and statistical power of each study, while allowing each to perform independent analyses and contribute to the development of different countermeasures.

Q5. How did ITS America evaluate the utility of the cost and benefit database that is maintained for categories of ITS products? Did you survey State and local governments to determine how often they used the database to guide their decisions and to determine if they felt the information was presented in a form that was useful to them? Is the information complete enough and comparable enough to enable State and local governments to be confident that the cost and benefit information will reflect their experience with these systems?

A5. ITS America has not undertaken a formal evaluation of the ITS costs/benefits database maintained by the U.S. Department of Transportation. The organization's assessment of the utility of the database to ITS stakeholders is based on informal feedback from ITS America members. We have found that the cost and benefit data are used extensively by operations-level ITS practitioners and transportation planners within state and local departments of transportation, as well as metropolitan planning organizations. These stakeholders have used the available data as input to modeling activities which have direct impact on decisions on whether to deploy ITS, and how much if it to deploy. One example of this is IDAS (ITS Deployment Analysis System), a sketch-planning tool for transportation planners to use in assessing the incremental costs and benefits of adding ITS to a regional transportation network.

However, ITS America has also received negative feedback from its membership on the utility of data from the ITS benefits and costs databases. Both databases represent compilations of small-scale studies of the deployment of a single ITS technology (such as a traveler information system or an advanced traffic management system) within a limited geographical area. These studies fail to capture the safety, security, or congestion mitigation benefits to be derived from the integration of multiple ITS technologies within a metropolitan area, and the sharing of resultant information with transportation planners, system operators, and the traveling public.

During the late 1990s, the U.S. Department of Transportation sponsored ITS Model Deployment Initiatives, designed to demonstrate the benefits of limited integration a select number of cities. These studies, while yielding useful data, only demonstrated the integration of two or three ITS technologies deployed on select corridors within a metropolitan area. However, to date, there has been no study that has attempted to measure the benefits to be derived from fully deploying and integrating multiple ITS technologies within a given metropolitan area. Such studies could better demonstrate the impact of full (rather than limited) deployment of ITS technologies on the traffic congestion experience within a given metropolitan area. Data derived from the study of a fully integrated network of transportation information would have far more utility to transportation planners than is presently available in the ITS costs and benefits databases.

Q5a. Did you survey State and local governments to determine how often they used the database to guide their decisions and to determine if they felt the information was presented in a form that was useful to them?

A5a. ITS America does not conduct formal surveys with state and local governments. However, USDOT does use a formal survey tool to gather the data that supports the deployment tracking database. This database provides extensive and detailed information about the extent of ITS deployment currently present in all 50 states, focusing on the Nation's 78 largest metropolitan areas, 30 of its medium cit-

ies, and 20 tourist cities. The high levels of responsiveness to this detailed survey seems to indicate that the localities surveyed find some intrinsic value to providing the information and being able to analyze it once all the results are compiled.

Q5b. Is the information complete enough and comparable enough to enable State and local governments to be confident that the cost and benefit information will reflect their experience with these systems?

A5b. The information in the ITS costs and benefits databases can provide states and localities with some of the necessary information to make their decisions whether to invest in ITS. However, the utility of this data has been limited by the relatively few number of studies available and the failure to include evaluations of integrated data from a metropolitan-area wide deployment of ITS.

Databases of this nature take a long time to populate, especially given the time frames needed for evaluation and operational testing activities. As more projects are evaluated, we obtain more and better data for a wider variety of technologies and systems. Populating the database is also dependent on the extent to which project managers document the results of ITS deployment. The U.S. Department of Transportation has attempted to address this issue by offering, through one of its contractors, a training course in ITS Evaluation Techniques. The Department of Transportation also surveys ITS practitioners with respect to cost/benefit data needs and attempts to fill these data gaps through its operational testing and National Evaluation programs.

However, even after taking these measures, the ITS costs and benefits databases will continue to be inadequate to meet the needs of State and local governments considering deploying ITS. Absent is data on the costs and benefits of fully deploying and integrating multiple ITS technologies within a given metropolitan area. A comprehensive study of a fully integrated network of transportation information within a given metropolitan area would provide transportation planners with a more complete and accurate assessment the potential benefits of ITS.

BIOGRAPHY FOR KATHERINE SIGGERUD

Katherine (Kate) Siggerud is an Acting Director of the Physical Infrastructure Team for the U.S. General Accounting Office (GAO). For the past several years, she has directed GAO's reviews of surface transportation issues including the investment requirements for transportation infrastructure, the effectiveness of transportation research programs, and the interaction between transportation and the environment. Ms. Siggerud received her Bachelor of Arts degree from Macalester College and a Master of Public Policy degree from the Humphrey Institute of Public Affairs at the University of Minnesota.

BIOGRAPHY FOR ANNE P. CANBY

Ms. Canby is President of the Surface Transportation Policy Project. She was formerly a Principal of Canby Associates and served as a Senior Consultant with Cambridge Systematics, providing consulting services to advance transportation choices. She served as Delaware's transportation secretary from 1993 to 2001. She is recognized nationally as a progressive leader in the transportation field for transforming a traditional highway agency into a multimodal mobility provider and as an advocate for integrating land-use and transportation planning. Under her leadership, the Department shifted emphasis from highway expansion to providing choice, preserving and managing the existing transportation system; improving transit service was a priority; the Department invested in integrated technology initiatives as part of its overall business plan in support of system management and internal operations; training and diversity programs were instituted to strengthen professional skills of Department staff; strong public outreach programs were initiated. A key area of emphasis was on shaping transportation projects to enhance communities. Ms. Canby has been recognized in the leading state newspaper as the most creative and competent cabinet member of the Carper Administration.

Prior to serving in this post, Ms. Canby lead a consulting practice focusing on institutional and management issues with particular emphasis on implementation of ISTEA.

She has served as Treasurer of the Massachusetts Bay Transportation Authority, Commissioner of the New Jersey Department of Transportation and Deputy Assistant Secretary of the U. S. Department of Transportation. Ms. Canby has served on the executive committee or board of numerous transportation organizations, including the Transportation Research Board, AASHTO, NASTO. She is a member of the Urban Land Institute, ITE's National Operations Steering Committee, and the Women's Transportation Seminar.

She has been recognized for her leadership by the American Public Transportation Association, the Association of Metropolitan Planning Organizations, and the DE Chapter of the American Planning Association.

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April 9, 2003

The Honorable Vernon J. Ehlers
Chairman, Subcommittee on Environment, Technology and Standards
U.S. House of Representatives
2320 Rayburn House Office Building
Washington, DC 20515-6301

Dear Chairman Ehlers:

This letter is in response to rules of the House of Representatives which require that each person who testifies before Congress fully disclose whether the organization represented received any federal funding in the two preceding years.

The Surface Transportation Policy Project (STPP) does not and has not received federal funding for its work during the past two years. However, STPP is the fiscal sponsor of Smart Growth America (SGA), an organization which received federal funding from the U.S. Environmental Protection Agency (EPA) last year. In June 2002, SGA received a \$65,000 grant from the EPA's Smart Growth program.

As such, STPP indirectly received federal funds from the EPA, serving as a pass through sponsor for the new organization. SGA is expected to receive 501c3 status in June 2003, when it will become fully financially independent.

If you require any additional information or clarification, please contact Nancy Jakowitsch at 202.974.5130. I look forward to testifying before the Subcommittee on Environment, Technology and Standards.

Sincerely,


Anne P. Canby
President
Surface Transportation Policy Project

ANSWERS TO POST-HEARING QUESTIONS

Responses by Anne P. Canby, President, Surface Transportation Policy Project

Questions submitted by Democratic Members

Q1. A recent article in the Washington Post indicated that children now spend a significant part of each day riding in a vehicle as parents transport their siblings and run household errands. This has implications for children's health and suggests that non-work commuting trips have been increasing. Are these types of trips and these "users" of the transportation system being considered within transportation research programs, statistics gathered by the Bureau of Transportation Statistics and in transportation system designs?

A1. The Bureau of Transportation Statistics is only beginning to really think of children as active users within the transportation system. The inclusion of young children (aged 0–5) in the 2001 National Household Travel Survey has filled a big gap in terms of our knowledge about children's travel patterns (this is the source of the data quoted in the *Washington Post* article). However, the focus of research to date in the transportation engineering field has been on child restraint systems for children as passive riders in vehicles. In-vehicle systems for child restraint have saved many lives—this is a success story that cannot be praised too much.

We are very concerned that the other side of childhood—the active side—is still being under-studied and under-valued. The U.S. Department of Transportation's bi-annual Conditions and Performance report of 2002 only addresses childhood travel in two paragraphs (discussing the school trip), in a report several hundred pages long. Transportation engineers need a rock-solid base of knowledge to work from when they begin a project that needs to be designed to create a high-performing pedestrian system for children using the transportation system under their own steam.

In terms of traffic safety, safe pedestrian facilities are even more important for children than adults. Young children do not have the ability to safely judge speed of oncoming traffic; pedestrian crossings and sidewalks must be designed with this in mind. Although traffic engineers have made great strides in regard to pedestrian safety methodology across the world, there remains a professional disregard for pedestrians and therefore for children in the U.S. transportation design world. Primary importance is still laid on level of service for motorized traffic, with little concern for level of service for pedestrians, especially child pedestrians. Active children are by definition walking or bicycling, as they cannot drive. These children cannot be protected by seat belts or other restraint systems. Even bicycle helmets have a limited value, as they only protect one vital part of the child's body.

Public health advocates have given us another reason lately to be concerned about safe activity for children. The CDC has found that children are now overweight at three times the rate they were in 1980. Moving around as part of daily chores—for example walking, rather than riding for even a part of children's current 62 minutes per day in the back seat—could make a huge difference in the physical activity level of children.

Air quality inside cars is another area of concern. In-car air quality has been shown to be 2–3 times worse than ambient air quality, and the amount of time and number of trips that young children make in cars has been increasing. Research in this area is badly needed, especially in light of the links that are being found between air pollution and childhood onset of asthma.

Transportation models still focus almost exclusively on peak-hour work trips, as these are the most predictable trips within the system. However, their decreasing share of the total—work trips in 2001 made up just 15 percent of all trips—indicates that models must change substantially to anticipate vehicular transportation throughout the day and different trip purposes and lengths. Models should also include multiple modes of travel in order to allow transportation planners to weigh pedestrian and other mode trips equally with vehicles.

Q2. How well is our transportation system serving the individuals in our society who cannot drive—the elderly, the disabled, the poor, and children? Are there adequate studies to examine the transportation needs of these individuals and to guide the development of programs to address their needs?

A2. Nearly six percent (5.9 percent) of Americans are 75 years or older according to the latest decennial Census data. Additionally, 6.5 percent of Americans have a disability that makes it difficult to go outside their homes. Almost 23 percent of Americans are 15 years or younger. And fully one out of ten American households

(representing about ten percent of Americans) do not own a vehicle. Clearly there is double-counting among these statistics, but a conservative estimate indicates that about one-third of Americans cannot drive because they are too young, too old, or too infirm.

In the wake of the recent tragedy in Santa Monica, California, a national debate has reemerged over older drivers. Richard Weller's unintentional but horrific crash is heartbreaking for all involved, both the victims, and Mr. Weller himself. Nearly all of the debate surrounding the issue focuses on licensing requirements and safety standards. While these are undoubtedly critical questions, they fail to address one of the most significant problems underlying the entire issue. Older Americans are reluctant to give up driving simply because they have no other choice.

Though children are restricted from driving, unlike older adults, they often enjoy the convenience of a chauffeur—their parents. According to the 2001 National Household Travel Survey (NHTS), more than seventy percent of all trips made by children six to 15 years of age are made in a private vehicle, with someone else at the wheel. This is up nearly 11 percent from the 63.4 percent of trips made by children in a private vehicle in 1977, and puts a tremendous burden on already overwhelmed parents.

The available data does not permit us to determine how many Americans cannot afford to drive. But there is data on the burden that transportation costs place on the poor. The Bureau of Transportation Statistics (BTS) examined this issue in a recently released Issue Brief. In that study the BTS found that the working poor who commute by private vehicle spend fully 21 percent of their income to get to and from work. In contrast, those making \$45,000 or more per year spent only 2.6 percent of their income on commuting by private vehicle, and the national average was just 4.9 percent. Data from the Bureau of Labor Statistics (BLS) also offers some insight into the high cost of transportation. According to the most recent Consumer Expenditures Survey from the BLS, the poorest fifth of families—making an average of \$7,911 per year, after taxes—spent 38 percent of their take home pay on owning and operating private vehicles.

We've engineered and planned ourselves into almost total dependency on one form of transportation, and now we're paying the price, in the form of social isolation, higher obesity rates (even among children), financial strain, and tragic accidents like the one that took ten lives in Santa Monica. Without the ability to drive, most Americans, and especially the elderly, young, poor, and disabled are left stranded at home and isolated from their friends and communities, unable to reach shops, doctors offices, or jobs without assistance from others.

Unfortunately, it is difficult to gauge the magnitude of the problem. While there is plenty of data and research on driving, there is much less on alternative modes such as public transportation, bicycling, and walking. And information on travel behavior by demographic groups is scarce. The most reliable source of this data is the National Household Travel Survey (previously called the Nationwide Personal Transportation Survey). But this survey is conducted infrequently—once every five years—and data is not available at the micro-level, except for a handful of larger metropolitan areas.

With one-third of Americans unable to drive, it is critical that we gain a better understanding of the travel behavior by this large segment of the population. Transportation planners must have more information on how, when, and where all members of society travel so that they can ensure mobility and access for all Americans.

Q3. Based upon your previous experience with the state of Delaware, please describe the characteristics of the employees of the state DOT and of the metropolitan planning organizations throughout your state. How many employees are in these organizations? What are their educational backgrounds? Does the Department hire primarily people with advanced degrees (Masters and Ph.D.s) or primarily people with Bachelor and Associate degrees? How has the set of needed skills changed over the past decade or so, if at all? If you could design a curriculum to train future employees of the state DOT or the metropolitan planning organizations, what skills would you consider to be of greatest value?

A3. Delaware's transportation agency has responsibility for almost the entire road network in the state, ranging from subdivision cul-de-sacs to the Interstate system. The DOT also operates all of the transit service in the state and owns several rail branch lines. There are two metropolitan planning organizations in Delaware with a combined staff of approximately 8–12. They are primarily planners and administrative staff.

The number of employees in the state DOT is approximately 2,000. The employee mix is composed of a range of job classifications. The bulk of the employees are highway maintenance workers and bus drivers. In addition, the Department is

staffed with transportation planners, civil engineers and engineering technicians who are responsible for system planning, project development and design, construction, and maintenance. There are also traffic engineers and technicians who focus on traffic operations. Toll collectors and mechanics are part of the workforce as well. The administrative support staff has finance, human resource, information technology, contract, budget and accounting personnel. I believe that some of the professional staff have advanced degrees, i.e., a B.S. in civil engineering with a Master's in planning, public administration or engineering. It is my assumption that most of the Department's professional staff have a Bachelor or associate degree. The salary levels offered by the state make it difficult to recruit candidates with advanced degrees. The more likely course is that some employees pursue advanced degrees with the Department's support during the course of their career.

As the agency moved, under my leadership, from a full time focus on road construction to greater emphasis on system operations, integrating technology into all aspects of our operations, greater emphasis on accommodating non-highway modes, much more public outreach, environmental stewardship, planning and financial management, the skills that we needed changed dramatically. Our move into technology highlighted the need for electrical and systems engineers; the upgrading of our planning activities required that trained planners rather than engineers be hired. Our emphasis in building pedestrian facilities highlighted the need for our planners and engineers to have a greater understanding of and appreciation for the pedestrian environment. It is relatively easy to design a sidewalk, but designing one that people find comfortable, safe and inviting to use requires different thinking than when designing just to move vehicles. In addition, the demand placed on the project design staff broadened beyond their normal technical training to include the need for project and budget management and public communications skills, greater creativity and flexibility in working with the engineering guidelines, and learning how to design transit and pedestrian facilities.

From my experience, the current engineering curriculum does not provide engineers with a broad enough perspective of the full range of disciplines they need in order to succeed in today's multimodal environment and collaborative decision-making process. Beyond individual training, the importance of having a mix of professional and technical skills working as a team is very important in developing the best transportation product and being able to make reasonable trade-offs between costs, public concerns, modal choice and technical engineering issues. In Delaware, we initiated a team approach for a select number of projects and found that not only was the product better, but that the staff recognized that bringing multiple skills together to develop the product was very rewarding.

Further, as we move into a world that requires the integration of all transportation modes into a seamless system, the demands for transportation system thinking capabilities will grow. State transportation agencies have to move away from the long standing dominance of the engineering mindset and broaden their cultures to include a broader systems perspective that incorporates multiple modes and disciplines in a balanced integrated organization. Two major challenges in accomplishing this are the fact that almost all the state DOTs are responsible for only one portion of one mode, state highways, and that engineers dominate the decision-making process within their agencies often to the exclusion of other professional disciplines.

To conclude, there are two directions that training and curriculum should address, first broadening the curriculum for the engineering staffs in DOTs to include areas that I mentioned above and learning to work in multi-disciplinary teams. The latter should be emphasized at both the undergraduate and graduate levels.

BIOGRAPHY FOR MICHAEL D. MEYER

Dr. Michael D. Meyer is a Professor of Civil and Environmental Engineering, and former Chair of the School of Civil and Environmental Engineering at the Georgia Institute of Technology. From 1983 to 1988, Dr. Meyer was Director of Transportation Planning and Development for Massachusetts where he was responsible for statewide planning, project development, traffic engineering, and transportation research. Prior to this, he was a professor in the Department of Civil Engineering at M.I.T.

Dr. Meyer has written over 140 technical articles and has authored or co-authored numerous texts on transportation planning and policy, including a college textbook for McGraw Hill entitled *Urban Transportation Planning: A Decision Oriented Approach*. He was the author of *Transportation Congestion and Mobility: A Toolbox for Transportation Officials*, a book sponsored by the Institute of Transportation Engineers and the Federal Highway Administration that focuses on transportation actions that can be implemented to enhance mobility. He is an active member of numerous professional organizations, and has chaired professional committees relating to transportation planning, public transportation, environmental impact analysis, transportation policy, transportation education, and intermodal transportation.

Dr. Meyer has worked closely with Federal, State, regional, and local transportation agencies in defining mobility strategies and policies targeted at improved transportation system performance. He is a noted speaker on many transportation issues and has been actively involved in many states and metropolitan areas in defining future transportation directions. He has consulted with numerous international, national, regional and local agencies in developing transportation plans and strategies that have been successfully implemented.

Dr. Meyer is the recipient of numerous awards including the 2000 *Theodore M. Matson Memorial Award* in recognition of outstanding contributions in the field of transportation engineering; the 1995 *Pyke Johnson Award* of the Transportation Research Board for best paper in planning and administration delivered at the TRB Annual Meeting; and the 1988 *Harland Bartholomew Award* of the American Society of Civil Engineers for contribution to the enhancement of the role of the civil engineer in urban planning and development. He was recently appointed to the Executive Committee of the Transportation Research Board.

Dr. Meyer has a B.S. degree in Civil Engineering from the University of Wisconsin, an M.S. degree in Civil Engineering from Northwestern University and a Ph.D. degree in Civil Engineering from M.I.T. He is a registered professional engineer in the State of Georgia.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Michael D. Meyer, Professor, Georgia Institute of Technology, School of Civil and Environmental Engineering

Questions submitted by Democratic Members

Q1. You indicated during the hearing that funds for transportation research should be increased. How large an increase would be appropriate (e.g. 5 percent, 10 percent)? Should some of the increase come through a re-direction of funding for other transportation needs? If so, from which areas should the funding be re-directed?

A1. My experience as a state DOT Director of Planning and Research has been that research often more than pays for itself through the greater efficiency or lower costs that result from the research products. By most measures, the transportation industry and profession are not investing enough in research, especially when compared to international practice.

The common practice in the public sector in the U.S. is to establish research funding programs through a “takedown” of federally allocated transportation dollars. Currently, the percentage takedown is 0.5 percent dedicated to research. I would recommend that this percentage be increased to 0.75 percent, realizing, of course, that many states would most likely oppose such a proposal. The increase is less than that recommended by the industry-led Research and Technology Forum, but their proposed doubling of research funding did not identify the federal-aid transportation program as the source of dollars. Some portion of this additional increase should be directed to national research programs that are not managed or directed by the state DOTs. In other words, this increase should not simply be used to augment the NCHRP program.

The issue of redirecting of funds is a difficult one. I have no doubt that existing research programs, by and large, are producing important results, even though some programs are targeted on fairly narrow topics. To redirect from these programs might be unproductive. The research program I am suggesting is a modest initiative, a suggested \$5 million, which could be easily attached to other proposed programs (e.g., F-SHRP or the Strategic Environmental Research Program). Importantly, however, Congress would have to be very specific on how these dollars were to be spent so that the intent of the program is met.

Q2. You stated in your testimony that we need to better understand our transportation system from a holistic view and understand the social and economic demands upon the system. We heard similar suggestions when authorized TEA-21 six year ago. Why do you think the transportation profession has been unresponsive to these types of analyses? You recommended the Transportation Research Board should oversee this type of research agenda. However, the proposal for F-SHRP does not include any of societal issues you feel need to be addressed. Given the composition of the Transportation Research Board, is there broad interest in supporting this type of research and then implementing the findings of the research?

A2. The “unresponsiveness” of the transportation profession to a holistic view of transportation system analysis is not so much an issue of desire as it is of funding. Most of the funding for transportation research comes from implementing agencies, that is, state DOTs, transit agencies, FHWA, and FTA. The National Science Foundation has recently begun to fund transportation-related research, but this has not focused on the bigger picture issues. There is little question that the product of our nation’s transportation research effort reflects the constraints placed upon it by funding sources.

With respect to F-SHRP, once again the defining boundaries of the research program were defined by agencies that desire short-term satisfaction, in this case, state DOTs (through AASHTO). The research is targeted in four areas—safety, reliability, capacity and operations. I was a member of one of the committees helping to define the types of projects in the program. Several of us attempted to broaden the perspective of the research program to no avail. Thus, however, does not imply that TRB is unable to guide a research initiative as I propose, because it all depends on how one establishes the program. TRB has an excellent record of managing research within the boundaries established by sponsors. TRB would be able to bring together the necessary disciplines (especially social sciences) to assure quality products.

As a member of the Executive Committee of TRB, I know many other Executive Committee members share my interest and excitement about a more holistic perspective on transportation research. With the well-established peer review process of TRB, I believe it remains the logical choice to administer this research effort.

Q3. You indicated in your testimony that the transportation profession has tended to neglect demographic and social trends and thus our highway planning is not as efficient as it could be. Why do you think transportation planners do not consider this type of information in their work? What recommendations would you make to encourage transportation professionals to consider these factors?

A3. I did not mean to imply in my testimony that transportation planners neglect demographic and social trends. Indeed, basic to any transportation planning effort is an initial activity to predict future demographic, economic and community characteristics in order to forecast resulting travel demands. However, in most cases, these efforts are fairly straight forward analysis efforts with little attempt to understand broader implications and consequences. A current example is the finding from the 2000 Census that as the population ages, more of the elderly population is remaining in the same household, instead of moving to retirement communities in the south and southwest. This so-called "aging in place" phenomenon has huge implications not only for transportation, but also for health, housing and recreational activities. The phenomenon could have been anticipated long before the 2000 Census by the transportation community.

In order for the transportation community to consider important trends in the context of its work, these trends must first be made known. This, of course, leads to the need for a research effort. Another important characteristic of getting the transportation profession to consider these factors is the dissemination of the results of the research. It is not helpful to conduct analyses on social, demographic, and technological trends if the results are not disseminated widely to the profession. This is another reason why TRB is an appropriate home for this research program. It has developed over many years very effective mechanisms to distribute the results of research to the profession.

Q4. You indicated in your testimony that you have just completed a research project that addressed how environmental considerations can be included much earlier in transportation planning and decision-making. You believe that this will allow projects to develop faster and will also result in better decisions. Could you explain how this would be done? Now that your research is completed, how could the findings be incorporated into standard practice?

A4. Our research project, entitled "Incorporating Environmental Considerations Into Transportation Systems Planning," was funded by NCHRP. We examined planning and project development for transportation projects to identify where environmental factors could be considered earlier in the decision making process. The intent was to develop better projects in a faster time frame. In every case study we examined, such as Florida, we determined that it is very possible to do so. One of the ways of doing this is to define an acceptable "purpose and needs" statement in the planning process that satisfies such a requirement during environmental analysis. The current attention given to context sensitive design is another example that illustrates the importance of collaborative planning and design early in project development. Developing a state inventory of environmentally sensitive areas is a critical foundation for doing any of this. It is surprising in today's age of database management and geographic information systems that many state DOTs have not done this. For example, I attended a conference last year on historic (Section 106) properties and the key finding was that state DOTs need to have an inventory of Section 106 properties. Incredible!

Our research project is recommending that environmental factors be considered early in the planning process (I would almost recommend that this be part of federal regulation, but NCHRP projects are not supposed to recommend policy changes). Such a change, along with concomitant tools, could easily be incorporated into standard practice.

Q5. In response to Congressional request, the Transportation Research Board examined the effectiveness of the Congestion, Mitigation and Air Quality (CMAQ) program. Couldn't all of the research programs, demonstration programs, and transportation projects benefit from the implementation of a more rigorous evaluation of their effectiveness? Has TRB designed a system to evaluate the effectiveness of the two cooperative research programs it administers? If so, please describe it briefly.

A5. I am a firm believer in the value of rigorous evaluation of the effectiveness of research programs and transportation projects. As a member of the TRB committee that evaluated the CMAQ program, I argued that some portion of the funds allocated to CMAQ should be devoted to project evaluation. It would most likely have to be an evaluation of a sample of project types given the large number of projects that are implemented each year. One of the reasons such evaluations are not done (in the absence of a mandate) is that they cost money. Sponsors would much rather use these funds for project implementation, rather than evaluation.

The TRB cooperative research programs have experienced varied levels of evaluation. The key characteristic of both the NCHRP and TCRP programs is that both are sponsor driven. The state DOTs guide the NCHRP program; transit agencies guide the TCRP program. The NCHRP program recently underwent a review by a panel of state DOT representatives which found that, in general, the program was reflecting the needs of the state DOTs. I am not aware of any similar evaluation of the TCRP program.

Appendix 2:

ADDITIONAL MATERIAL FOR THE RECORD



Approximately one-half of one percent of highway spending is allocated for research — less than in practically any other industry. Nevertheless, highway research has been a major contributor in providing the United States with a modern system that accommodates more than 2.7 trillion vehicle miles of travel each year and moves 1.3 trillion intercity miles of freight.

Because of improvements pioneered through research, travelers benefit from longer lasting pavements, structurally sound bridges, and advanced traffic management systems. While much has been accomplished, many problems remain, especially reducing highway fatalities and solving traffic congestion.

MARCH 2003



SAVING LIVES, TIME, AND MONEY

Research is crucial to advances that can save lives, time, and money. AASHTO believes Congress should significantly increase the resources for a comprehensive program of transportation research which includes several components:

- State Planning and Research, including the National Cooperative Highway Research Program;
- FHWA's Surface Transportation Research Program;
- The University Transportation Centers program managed by RSTA;
- The Future Strategic Highway Research Program (F-SHRP);
- Intelligent Transportation Systems (ITS) Research and Deployment;
- Safety research conducted by FHWA, NHTSA, and FMCSA; and
- Federal Transit Research, including the Transit Cooperative Research Program.

Among the successes of past research programs are the following:

SUPERPAVE AND HIGH PERFORMANCE CONCRETE

Advanced materials developed under the Strategic Highway Research Program (SHRP), Superpave and High Performance Concrete (HPC) have revolutionized the industry. Superpave is an asphalt pavement that rides smoother and lasts longer. Last year, over 60 percent of all state paving projects used Superpave. This new technology has reduced maintenance and rehabilitation costs, and the need for frequent work zones that slow traffic and endanger workers and motorists. High Performance Concrete (HPC) makes it possible to engineer concrete for bridges that last longer, perform better, require lower maintenance costs, and cost less to build.

SAFETY

Research on vehicles, drivers, and highway design has paid off in lives saved. New guardrails and median barriers have reduced the severity of crashes and rumble strips are preventing head-on crashes and run-off-the-road crashes. Advanced electronic technologies are helping to keep vehicles on the roadway, brake automatically when following too closely, automate speed and red-light running enforcement, and warn motorists of dangerous intersections.





AASHTO's recommendations are:

Maintain the State Planning and Research Program (SP&R)

Congress should continue SP&R in its current, formula-based configuration (i.e., two percent of federal-aid programs, with a 25 percent minimum for research). SP&R-supported research is focused on finding solutions to problems experienced by state DOTs. Through SP&R the states support the National Cooperative Highway Research Program (NCHRP) which addresses matters that affect highway planning, design, construction, operation, and maintenance nationwide.

Federal Highway Administration Research and Technology Transfer

AASHTO recommends that FHWA's Surface Transportation Research Program be increased by 50 percent from \$101.5 million to \$150 million annually.

Congress should require FHWA to focus on fundamental research, high risk/high payoff studies requiring a longer-term effort, research on national-level problems related to FHWA's mission, and technology transfer. Funding for FHWA research should be increased and stabilized. Reauthorization should require that FHWA's research program be based on consultation with its stakeholders, especially state departments of transportation.

This research should undertake a focused effort on pavement, including full funding of the \$20 million per year Long Term Pavement Performance data collection effort, leading to completion of the LTTP program by 2008. The current level of \$19 million per year for pavement research needs to be significantly increased. Research should continue in such important areas as developing mechanistic design models, advancing the construction and performance specifications for Superpave, promoting pavement preservation techniques and understanding, and advancing construction techniques for major rehabilitation and new lanes on existing facilities under heavy traffic conditions and tight geometries.

AASHTO recommends the following spending priorities:

- Dedicate \$15 million annually to fund a new cooperative environmental research program;
- Dedicate \$15 million annually to fund two freight initiatives: a cooperative freight research program at \$8 million; and a freight capacity building program for states and MPOs at \$7 million;
- Increase funding for the University Transportation Centers from \$32.5 million to \$50 million annually. The UTC program supports research and technology transfer, and prepares students for careers in transportation;
- Increase national-level research; and
- Double the Local Transportation Assistance Program (LTAP) and increase other technology transfer programs, such as the National Highway Institute.



FUTURE STRATEGIC HIGHWAY RESEARCH PROGRAM (F-SHRP)

In addition to the ongoing research programs supporting surface transportation innovation, AASHTO supports a special-purpose program to concentrate additional resources on accelerating progress toward a few high-priority objectives. Based on the success of this approach in SHRP over the past decade, Congress requested a study in TEA-21 to determine if a similar program could be used to advance a new set of strategic transportation goals. The outcome of this study was a recommendation to create a Future Strategic Highway Research Program (F-SHRP).

AASHTO supports funding this initiative at \$492 million over six years through a percentage set-aside of the overall federal-aid highway program. The program would be administered by the National Academy of Sciences through the U.S. DOT and under the guidance of key stakeholders, primarily state DOTs through AASHTO.

The program will focus on achieving four major goals:

Renewal: Accelerating the Renewal of America's Highways

Today's highway system is in need of extensive renewal, which must often be performed while the facilities remain in service. The public demands that this work be done quickly, with longer-lasting materials and with as little disruption as possible. F-SHRP will develop tools highway agencies need to implement a new model of highway renewal, including new materials and equipment, information technologies, and new construction and operations methods.

Safety: Making a Significant Improvement in Highway Safety

Each year almost 42,000 people are killed on the nation's highways, and three million are injured. Changes in vehicles, demographics, driver behavior, and increasing auto and truck travel all contribute to the safety challenge. Fundamentally better knowledge on the human factor involved in crashes is needed. The technology now exists to make advances in collision prevention comparable to advances in injury prevention made in the last two decades. F-SHRP will focus on run-off-the-road and intersection crashes, as well as pedestrian safety. The results of this research will support new and better safety countermeasures.

Reliability: Providing a Highway System with Reliable Travel Times

Commuters and business alike are frustrated over the lack of predictability in the time required for their travel. Not only is reliability important, it is also a piece of the congestion problem where significant gains can be made, even as travel demand grows. FHWA reports that at least half of traffic delays stem from factors other than capacity: 25 percent crashes and breakdowns, 15 percent bad weather, 10 percent work zones, and five percent special events. F-SHRP will develop techniques to greatly improve the reliability of highway travel times by reducing the frequency and effects of such events.

Capacity: Providing Highway Capacity in Ways Compatible with Community and Environmental Goals

Due to increases in population and auto and truck travel, congestion is a growing problem. Meanwhile it is getting tougher and taking longer to build needed new highway capacity, because of its associated impacts, community resistance, and other regulatory requirements. After maximizing the relief which transit and operational improvements can bring, net gains in highway capacity will still be required. F-SHRP will develop tools to improve the responsiveness of the planning and design process so that needed highway capacity can be produced in ways that support both healthy economies and livable communities.





ITS RESEARCH AND DEPLOYMENT

ITS Research

Funding for ITS research, standards, testing, and professional development should be increased to \$125 million annually. This will fund continued work on the development of a common ITS architecture, standard setting, professional development, and training. Research priorities will include work on intelligent vehicle initiatives, including human factors, remote sensing, intermodal freight, and advanced transit systems.

ITS Deployment

Funding for ITS deployment should be increased to \$142 million annually. This will help advance new technologies such as the "I11" traveler's information system, CVISN to expedite truck cargo movement, safety initiatives, traffic incident response, and road weather monitoring and reporting.

SAFETY RESEARCH FOR NHTSA, FMCSA, AND TSMS

Funding should be increased for Federal Motor Carrier Safety Administration research from \$10 million to \$30 million, of which \$10 million should be used for a new Cooperative Truck Research Program.

Funding should be increased for National Highway Traffic Safety Administration research from \$66.3 million to \$15 million.

From the increased FHWA, NHTSA, and FMCSA research programs, \$10 million dollars should be dedicated over two years to partner with the states in the development of a comprehensive system (TSIMS — Transportation Safety Information Management System) to capture, store, analyze, and report comprehensive safety crash and traffic data.

TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP) AND FTA RESEARCH

The TCRP program has been flat lined at less than \$8.5 million annually. This program should be increased to at least \$15 million annually, contingent on a significant increase in the overall transit program.

FTA's research program should be increased from its present level of approximately \$51 million to at least \$20 million annually, contingent on an increase in the overall transit program.



American Association of State Highway and Transportation Officials
www.transportation.org

MARCH 2005

STATEMENT OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

Transportation Research and Development: Investing in the Future

Mr. Chairman and Members of the Subcommittee:

The American Society of Civil Engineers (ASCE) is pleased to provide this statement on the “Transportation Research and Development: Investing in the Future” for the record as the Subcommittee on Environment, Technology and Standards examines the reauthorization of the Nation’s surface transportation research and development programs.

ASCE, founded in 1852, is the country’s oldest national civil engineering organization representing more than 130,000 civil engineers in private practice, government, industry and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE is a 501 (c) (3) non-profit educational and professional society.

ASCE believes the reauthorization of the Nation’s surface transportation programs should focus on three goals:¹

- **Expanding infrastructure investment**
- **Enhancing infrastructure delivery**
- **Maximizing infrastructure effectiveness**

Under the banner of “Maximizing Infrastructure Effectiveness,” ASCE supports a number of initiatives including a robust and multi-faceted research and technology program. Research funding is critical to achieving national transportation goals in safety, quality of life, economic health, environmental impacts, sustainability and security.

A. Role of Federal Government in Civil Engineering R&D

The American Society of Civil Engineers (ASCE) supports a focused federal civil engineering R&D program consistent with national goals. Programs should promote new U.S. capabilities, improve efficiencies and advance the practice of civil engineering to improve the quality of life.²

ASCE encourages coordinated and integrated basic and applied civil engineering research that leverages federal R&D funds through government-university-industry partnerships. Programs fostering basic research should focus on maintaining a steady flow of talent and technology to U.S. industry and agencies. Programs focusing on higher risk research with the potential for high payoff should meet national needs and improve the quality of life by:

- Enhancing public health and safety;
- Enhancing environmental quality;
- Supporting the goals of sustainable development;
- Improving public works infrastructure;
- Improving global competitiveness in U.S. civil engineering products and processes; and
- Enhancing national security.

B. Research & Development Programs & TEA-21 Reauthorization

The Highway Trust Fund has been an essential source of funding for surface transportation research and technology (R&T) for decades. Research results have led to many benefits including: materials that improve the performance and durability of pavements and structures; design methods that reduce scour (and consequent threat of collapse) of bridges; intelligent transportation systems technologies that improve safety and reduce travel delay; methods and materials that radically improve our ability to keep roads safely open in severe winter weather; innovative management approaches that save time and money; analytical and design approaches that reduce environmental impacts that support sustainable development and improve the aesthetic and cultural aspects of transportation facilities.

These benefits are provided through several major transportation research programs. In the highway area these programs include the Federal Highway Adminis-

¹To read ASCE’s “Reauthorizing the Nation’s Surface Transportation Program: A Blueprint for Success,” visit www.asce.org/govrel/tea3

²American Society of Civil Engineers, Policy Statement 444, “The Role of the Federal Government in Civil Engineering Research and Development,” 2002.

tration (FHWA) program, the National Cooperative Highway Research Program (NCHRP), and state department of transportation programs largely funded through State Planning and Research (SPR) funds. In the transit area the main programs are that of the Federal Transit Administration (FTA) and the Transit Cooperative Research Program (TCRP). The University Transportation Centers (UTC) program supports various transportation modes.

In the Transportation Equity Act for the 21st Century (TEA-21), funding for the highway research programs was shifted away from FHWA and toward states and universities. In addition, a significant increase in congressional earmarking (a practice already common in the FTA program) occurred in FHWA's program. As a result, some products and services previously provided by FHWA had to be absorbed by the state programs or discontinued. On the transit side, TEA-21 provided a significant increase in transit program funding but did not provide sufficient research funding in TCRP.

ASCE supports the following general principles in the reauthorization of research and technology programs in the Transportation Equity Act for the 21st Century:³

- Improvements resulting from research and technology are critical to achieving national transportation goals in safety, quality of life, economic health, environmental impacts, sustainability and security.
- Adequate funding should be dedicated to R&T activities.
- Research programs should be conducted according to the highest scientific and engineering standards, from priority-setting to award of contracts and grants to review and evaluation of research results for implementation.
- Research programs should be carried out with appropriate involvement from stakeholders in the public, private and academic sectors.
- Technology transfer activities are critical to successful implementation of research results and should be supported with R&T funds.
- Public-private partnerships should be fostered by identifying appropriate roles for each partner and providing incentives for private investment.

Within the context of the general principles set out above, ASCE supports the following actions regarding specific surface transportation R&T programs:

- The research and technology portion of the SPR program should be maintained to help support state-specific activities while continuing to encourage the states to pool these resources to address matters of more general concern.
- University research should continue to be supported through the UTC program, using mechanisms that ensure both competitive availability of funds and support for emerging programs.
- FHWA's program should be strengthened by giving it sufficient funding and flexibility to implement the recommendations of *TRB Special Report 261, The Federal Role in Highway Research and Technology* to focus on fundamental, long-term research; to perform research on emerging national issues and on areas not addressed by others; to engage stakeholders more consistently in their program; and to employ open competition, merit review, and systematic evaluation of outcomes.
- A future Strategic Highway Research Program (F-SHRP), as recommended in *TRB Special Report 260, Strategic Highway Research*, should be authorized to accelerate solutions in four critical problem areas: rapid infrastructure renewal, highway safety, travel time reliability, and design for new capacity that meets environmental and community requirements.
- FTA's research program should be given sufficient funding and flexibility to work with its stakeholders to develop and pursue national transit research priorities.
- TCRP funding should be increased to reflect the growth in the transit program over the last authorization period.

C. Intelligent Transportation Systems

Intelligent Transportation Systems are a cost-effective means of addressing rising demand by increasing the efficient utilization of our transportation systems. The technology revolution in transportation will require a wide range of independent yet coordinated actions by public and private sector interests, which must be sustained by a major federal commitment. The Federal Government should provide the leader-

³American Society of Civil Engineers, Policy Statement 497, "Surface Transportation Research Funding," 2002.

ship and commitment to direct the complete deployment of ITS for consumers of passenger and freight transportation across the Nation.

The technology revolution in transportation will require a wide range of independent yet coordinated actions by public and private sector interests, which must be sustained by a major federal commitment.

A vast domestic market and a technology based industry are directing domestic transportation into the information age to better serve consumers. The deployment of ITS will enhance the overall transportation system through:

- Increased safety
- Improved mobility
- Reduced congestion
- Facilitated interstate commerce
- Generated new employment opportunities
- Improved international competitiveness
- Improved environmental protection
- Conserved energy
- Facilitated intermodalism

ITS are being deployed to enhance:

- Travel and transportation
- Travel demand management
- Public transportation options
- Electronic payment
- Freight management
- Commercial vehicle operations
- Emergency management
- Incident management
- Advanced vehicle control and safety

The American Society of Civil Engineers (ASCE) supports Intelligent Transportation Systems (ITS) as a cost effective means of addressing the rising demand by increasing the efficiency of our transportation systems.⁴ The Federal Government should provide the leadership and commitment to direct the complete deployment of ITS for consumers of passenger and freight transportation across the Nation.

ASCE strongly endorses federal leadership in research and development and the timely deployment of Intelligent Transportation Systems (ITS) nationwide to increase the efficient utilization of our transportation systems and enhance safety through the application of technology advancements.

D. Conclusion

As Congress grapples with the reauthorization of the Nation's surface transportation program ASCE supports funding for a robust and multi-faceted research and technology program. This funding is critical to achieving national transportation goals in safety, quality of life, economic health, environmental impacts, sustainability and security.

The lack of adequate investment in America's infrastructure has left us with a vast backlog of deteriorated facilities that no longer meet our nation's increasing demands. To remedy America's current and looming problem, ASCE estimated in 2001 a \$ 1.3 trillion investment in all categories of infrastructure over the next five years and called for a renewed partnership among citizens, local, State and Federal Governments, and the private sector.

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⁴American Society of Civil Engineers, Policy Statement 454, "Intelligent Transportation Systems," 2002.

STATEMENT OF THE AMERICAN ROAD AND TRANSPORTATION BUILDERS ASSOCIATION

Chairman Ehlers, Congressman Udall and Members of the Subcommittee, the American Road and Transportation Builders Association (ARTBA) appreciates the opportunity to submit its views on the importance of transportation research and development and reauthorization of the transportation research, development and education programs.

Founded in 1902, ARTBA represents the interests of the U.S. transportation construction industry before Congress, the White House, federal agencies, news media and general public. Over the past century, its core mission has remained focused on aggressively advocating federal capital investments to meet the public and business community's demand for safe and efficient transportation. The transportation construction industry ARTBA represents generates more than \$200 billion annually to the Nation's Gross Domestic Product and sustains more than 2.5 million American jobs. ARTBA's more than 5,000 members come from all sectors of the transportation construction industry. Thus, its policy recommendations provide a consensus view.

Two years ago, ARTBA's members prepared a comprehensive report detailing the transportation construction industry's recommendations for reauthorization of the federal highway and mass transit programs. The report, titled "A Blueprint for Year 2003 Reauthorization of the Federal Surface Transportation Programs," focused not only in the appropriate funding levels for these programs during the next six years, but also made specific recommendations for program improvements in a number of areas including research and development.

During the past year, ARTBA has testified before committees of the both the House of Representatives and the Senate in support of funding the federal highway and mass transit programs at the level required during the next six years to meet the Nation's transportation investment requirements. Based on the findings of the U.S. Department of Transportation's *2002 Report to Congress on the Conditions and Performance of the Nation's Highways, Bridges and Transit*, a federal highway program averaging \$50 billion per year will be needed during the next six years just to maintain current physical and travel conditions on the Nation's highways. The federal mass transit program would need to average about \$12 billion per year just to maintain conditions. We strongly support the recent proposal by the bipartisan leadership of the Transportation and Infrastructure Committee to provide needs-based funding levels for these programs as part of TEA-21 reauthorization and to increase federal investment in highways, highway safety and transit from \$50 billion in FY 2004 to \$75 billion in FY 2009.

In conjunction with this proposed increase in overall program funding, ARTBA would support a doubling of federal investment in transportation research, development and education.

Specifically, ARTBA supports the proposed Pavement Research and Technology Program advocated jointly by the American Concrete Pavement Association (ACPA), the National Asphalt Pavement Association (NAPA) and the National Stone, Sand and Gravel Association (NSSGA), who are all ARTBA members.

This program would directly address what we see as a major shortcoming of the current highway research effort—the lack of effective communication between the research community and the private sector—to ensure that priority is given to research that can quickly provide tangible results on the construction site.

The ACPA-NAPA-NSSGA proposal would address this by bringing the academic, government and private sector stakeholders together to help set at least a portion of the highway research agenda and then ensure dissemination of the results into the field.

We urge the Science Committee to support inclusion of this proposal in the TEA-21 reauthorization legislation.

ARTBA is also working closely with the American Association of State Highway and Transportation Officials, the Council of University Transportation Centers, the American Public Transportation Association, the Intelligent Transportation Society of America and others to ensure that all members of Congress understand the importance of federal funding for transportation-related research and education and the long-term benefits they provide the U.S. economy.

ARTBA's specific recommendations for transportation research and development follow:

- ☐ **Invest in Research, Development and Technology Transfer to Improve U.S. Road and Bridge Durability & System Performance**

Research and implementation of developing technologies is crucial to the much-needed continuous improvement of transportation and is vital to the United States socioeconomic system.

The United States surface transportation system must continue to develop for the country to maintain its economic and political leadership role of the free world countries. The goal of this evolution should be a more efficient and technologically advanced surface transportation system that better serves the business and social interests of the citizens of the country. An enhanced surface transportation system will improve domestic competition, increase the country's ability to compete globally, and provide for an improved social environment.

These potential improvements, however, are dependent on a research and corresponding technology deployment program that addresses the major concerns and issues of a surface transportation system. Thus, it is imperative that a relevant program of basic and applied research be further developed that focuses on the pragmatic issues of planning, programming, managing, building, reconstructing, maintaining and operating a long-lasting surface transportation system in a safe and environmentally sound manner. Further, such a program should also include a basic research component that allows technological breakthroughs that provide the foundation for further advances in the near- as well far-term.

☐ **Integrate Transportation Research Through a National Strategic Research Plan**

Given the importance of research to the continued development of transportation and the limited nature of the scarce resources to conduct research a strategic plan for transportation research should be developed by the stakeholders (Federal, State, private sector, and universities) based on ongoing efforts of the National Partnership Forum, the RTCC, and F-SHRP that provides the necessary guidance for maximizing the contribution that research can make to transportation.

☐ **Expand Federal Funding for Research**

Increased federal investment in research is consistent with the need for an integrated and standardized national transportation system and commensurate with the ability of research to add value to the field of transportation by improving the overall cost-effectiveness, durability, safety and environmental soundness of highway and bridge projects to meet national mobility requirements.

Federal surface transportation research activities should include projects that address construction materials, innovative technologies, intelligent processes and methods, inventive contracting and financing, and promotes the testing and experimental use of innovative technologies and materials.

The reauthorization of TEA-21 should establish roadway safety as a priority for federal research activities. The program, which could be entitled "Quantum Leap In Road Safety," should seek to apply new technologies and other innovations to help advance new infrastructure safety initiatives.

☐ **Ensure Federal Research Funds Are Based on Merit**

To maximize the benefit of limited federal research dollars, investments in research should be merit based and used consistently with the strategic research plan. An advisory panel of Federal, State, educational institutions and private sector stakeholders should be created to make recommendations for the disbursement of federal research funds.

☐ **Use New Technologies to Help Meet System and Mobility Needs**

U.S. mobility can be improved through breakthrough advances in adapting and integrating existing and new technologies into transportation by continued federal investment in transportation technology through the Intelligent Transportation System (ITS) and Technology Deployment programs. To ensure the wise use of federal investments in this area, the U.S. General Accounting Office or U.S. DOT should evaluate past ITS expenditures and report on their effectiveness.

☐ **Adequately Fund University Research**

Higher educational institutions are uniquely positioned to provide solutions to complex problems and opportunities for states to develop a university research program that focuses on each state's individual transportation challenges. Increased federal investment in the University Transportation Centers Program will capitalize on this critical role and allow each state to participate in resolving regional and national issues through partnerships with universities.

☐ **Provide Funding for Transportation Education Programs**

A well-trained and educated workforce is critical to meeting the growing challenges that face the Nation's transportation network. Consequently, a federal research program that promotes careers in transportation should be initiated to further develop knowledge workers for the transportation community. This initiative will help ensure human capital is available to: construct and maintain the Nation's transportation network using the latest techniques and technologies; educate the prospective transportation leaders in a innovative, enlightened, and competent fashion; and operate the transportation system to produce significant increases in mobility for the United States.

☐ **Invest in Federal Technology Transfer Initiatives**

The reauthorization of TEA-21 should provide the necessary finding for technology transfer to the transportation construction and corresponding support industries to ensure the latest knowledge and information is available to accelerate the development of needed transportation improvement projects. These initiatives should also seek to enhance the safety, quality, and durability of the Nation's transportation infrastructure.

☐ **Funding Recommendations by Program**

The funding recommendations in Table 2 capitalize on the specific research priorities identified above. These recommendations provide sufficient investment to fund specific projects of national importance, while at the same time ensure adequate resources for the continued development of important research and education programs at the discretion of the U.S. DOT. The roughly 50 percent increase in federal transportation research investment recommended below should be derived exclusively from aggregate increases in the federal surface transportation program and should not come at the expense of any current transportation initiatives.

Table 2 - Programs Suggested for ARTBA Support & Recommended Funding Levels					
Program	Last year of ISTEA	Annual Authorization Recommended (\$ millions)			
		TEA-21		Proposed	
		Average	FY 2003	First year	Last year
Surface Transportation Research Program	101.6	98.7	103.0	150.0	190.0
Technology Deployment	61.0	41.7	50.0	90.0	90.0
Local Technical Assistance Program	8.8	8.5	10.0	15.0	20.0
National Highway Institute	4.3	6.5	8.0	15.0	20.0
Eisenhower Fellowships	2.0	2.0	2.0	2.5	3.0
Subtotal	177.7	157.4	173.0	272.5	323.0
University Transportation Centers Program	19.2	32.5	32.5	90.0	90.0
ITS Initiative	232.4	213.7	232.0	250.0	250.0
F-SHRP				75.0	75.0
Quantum Leap in Road Safety		(New Program)		20.0	20.0
Promoting Careers in Transportation, K-12		(New Program)		1.0	2.0

☐ **Financing the Federal Surface Transportation Program in the Future**

To address the long-term needs of the Nation's transportation infrastructure system and the inevitable evolution of motor vehicle propulsion systems, federal policy should explore utilizing technology (such as a universal computer chip, global positioning system or other alternatives) to develop an architecture or mechanism that tracks the amount of vehicular travel, while respecting individual motorists' privacy. The system should also be capable of interfacing with the electronic highway.

This proposal would transition the Nation to a post fuels-based surface transportation financing system that imposes a user fee based on travel volume. The objective of the system would be to ensure motorists contribute to surface transportation infrastructure improvements commensurate with their respective travel volume. The principle of the new financing system would be insulated from inevitable vehicular or fuels-based advances. Congress should seek to build on any ongoing research in this area during the reauthorization of TEA-21.

Again, ARTBA appreciates the opportunity to submit our views on reauthorization of the transportation research, development and education programs.

STATEMENT OF PHILIP J. TARNOFF

DIRECTOR, UNIVERSITY OF MARYLAND, CENTER FOR ADVANCED TRANSPORTATION
TECHNOLOGY ON BEHALF OF THE INSTITUTE OF TRANSPORTATION ENGINEERS

PROVIDING A SAFE, RELIABLE AND SECURE TRANSPORTATION SYSTEM

My name is Philip J. Tarnoff. I am a member of the Institute of Transportation Engineers (ITE) and the Director of the University of Maryland, Center for Advanced Transportation Technology. I appreciate the opportunity to represent ITE and to provide the organization's recommendations on research priorities for the re-authorized surface transportation bill.

ITE is an international member educational and scientific association. The organization's 13,000 U.S. members include traffic and transportation engineers, transportation planners and other professionals who are responsible for meeting society's needs for safe, efficient surface transportation through planning, designing, implementing, operating and maintaining our transportation system nationwide.

ITE supports a policy that meets society's need for the safe, reliable and secure transport of persons, services and goods. ITE envisions an effective system that maximizes transportation system performance through a coordinated and integrated decision-making approach to (1) construction, (2) preservation, (3) management, and (4) operation of transportation facilities.

Federal, State and local governments, transportation professionals and citizens face critical transportation realities—increased person and vehicles miles traveled, increased demand on public services, the need to support economic growth, reduced mobility of an aging population, increased demand for special needs in accordance with ADA guidelines, heightened security threats to the system and infrastructure, and continued growth of metropolitan workforces. The Federal Highway Administration (FHWA) estimates that the lack of attention to managing and operating our transportation system has resulted in declining reliability of the transportation network, increased congestion and associated negative impacts on safety, the economy and the quality of life of the traveling public. The public is demanding more reliable and dependable transportation services and systems. This demand must be met by refocusing funding priorities to invest in research that will aid transportation professionals in meeting public needs.

Building for the Future Through Research

A coordinated national transportation research and development program will continue to be the basis for future transportation progress at the national level. Continuing research in transportation cannot be accomplished solely at the state and local level, or in the private sector. The Federal Government must play a strong leadership role in the coordination and pooling of resources for research and development that cuts across systems and modes. In order to ensure the maximum benefit to the traveling public, the results of this research must be made available as quickly as possible for application nationwide.

Transportation research is critical in advancing technology and improving safety. It is an essential tool for transportation professionals in developing practical solutions to problems encountered in the design and daily operation of our national transportation system. ITE supports the ongoing work of the Federal Highway Administration's Research and Technology Program (FHWA R&T), University Transportation Centers (UTCs), the Department of Transportation's in-house research, the Transportation Research Board's Cooperative Research Programs (NCHRP and TCRP), and the emerging transportation research program of the National Science Foundation. These programs appropriately encourage a collaborative environment for the support of research in the areas of safety, reliability and security. Accordingly, ITE has six major recommendations on research that should be incorporated into the revised surface transportation bill.

1. Fund the Future Strategic Highway Research Program (F-SHRP) through 1/4 of one percent take-down of federal highway funds—approximately \$450 to \$500 million over the life of the bill.

Congress authorized the Strategic Highway Research Program (SHRP) in the Intermodal Surface Transportation Efficiency Act (ISTEA). The five-year, \$150 million program was designed to improve the performance and safety of highway materials and highway maintenance practices for highway workers and users. In the Transportation Equity Act for the 21st Century (TEA-21), Congress requested the

Transportation Research Board (TRB) to set priorities and design a new strategic highway program.

ITE strongly believes that Congress should endorse the funding levels and program goals of F-SHRP as recommended by the TRB research group. They are:

- To accelerate the renewal of America's highways by developing a consistent, systematic approach to performing highway rehabilitation. Research performed in this area would provide for the better use of resources (equipment and person power) when performing maintenance projects to reduce the time wasted, congestion and traffic delays in commercial and residential areas. Delays in work zone areas, which have been expressed as among the major concerns of daily roadway travelers, could also be reduced.
 - To make a significant improvement in highway safety by preventing or reducing the severity of highway crashes through a combination of improved data collection, traditional crash analysis, and crash information management. Research in the application of these tools will assist in developing effective countermeasures to crash-related deaths and injuries. According to the TRB report, "every one percent improvement in highway safety resulting from application of the results of this research would mean more than 400 lives saved, 30,000 injuries averted, and \$1.8 billion in economic costs avoided annually."
 - Providing a highway system with reliable travel times through the prevention and reduction of nonrecurring incidents. Research in this area should focus on studying traffic data, its impact on transportation users and user-expectations to improve traffic operations tools for reducing delays, improving quality of life, and increasing consumer savings.
 - Providing highway capacity in support of the Nation's economic, environmental and social goals by developing approaches and tools for the systematic integration of environmental, economic and community requirements into the analysis, planning, and design of new highway capacity. Under F-SHRP, a context-sensitive approach to highway design would be formulated to include the best engineering, economic, environmental, social and aesthetic practices in the highway development process. This type of research would allow for increased capacity where needed, while meeting or exceeding the economic, social and environmental needs of the highway user.
- 2. Increase funding for the Transit Cooperative Research Program (TCRP) from \$8.25 million per year—which has not increased since 1993—to \$15 million in FY 2004 and ensure future increases are proportional to increases in federal transit allocations.**

Transportation research is critical in advancing technology and innovation so necessary for America to maintain its edge in the global economy. In a more direct sense, certain practical, applied transportation research is also necessary to help transportation providers, consultants and suppliers develop practical solutions to everyday problems they encounter in the design and operation of efficient and effective transportation services.

Since the establishment of the TCRP program through ISTEA and continued in TEA-21, the overall federal investment in surface transportation programs has grown considerably. Funding for the TCRP program, by contrast, has not. TCRP started with \$9 million in 1992, and currently receives \$8.25 million, despite its impressive record of achievement. Further, even less money is actually available to TCRP for industry-generated research as a result of substantial earmarking by Congress.

3. Require more focused research on intersection safety countermeasures.

In 2000, more than 2.8 million intersection-related crashes occurred in the U.S.—approximately 44 percent of all crashes reported that year. Further over 8,500 fatalities (23 percent) and nearly one million injuries (more than 48 percent of all injury cases) occurred at or within the vicinity of an intersection.¹ ITE's International Board of Direction has identified transportation safety as a priority topic for the organization. Intersection safety is an integral piece of ITE's Safety Action Plan. ITE's primary aim is to provide transportation professionals with the tools necessary to reduce fatalities, injuries and property damage due to intersection-related crashes.

In November 2001 ITE, in partnership with FHWA hosted a conference on intersection safety that drew transportation professionals from across the country. The attendees identified the need for additional data regarding the human, operations

¹Intersection Safety Issue Briefs, 2002.

and design factors that lead to reduced intersection safety. Accordingly, ITE recommends that the reauthorized bill include additional resources for research focusing on:

- Human factors related to drivers' decision-making processes within the intersection environment;
- Best practices on the provision of intersection and safety information to drivers;
- Costs-benefits analysis of intersection safety countermeasures;
- Advanced technologies including intersection collision avoidance systems;
- Clarifying the benefits and dispelling the myths associated with automated enforcement; and
- Ways to facilitate the expedient exchange of gathered information and field application results achieved nationwide.

4. Require the Secretary of Transportation to initiate a study through the National Academy of Sciences to identify best practices of incorporating operations and safety into the planning process.

In October 2001, ITE, as a member of the National Steering Committee on Transportation Operations, hosted the National Summit on Transportation Operations with FHWA. The meeting was an effort to bring together professionals representing various transportation modes to identify the needs and opportunities for enhancing transportation operations. According to the meeting participants, effective management and operations comprises a cooperative and collaborative environment that bridges modes, jurisdictions, and multiple professions in order to maximize the efficiency and safe operation of transportation systems.

The management and operations spectrum ranges from planning and managing transportation resources and systems over the longer term to the everyday maintenance and real-time operations of individual facilities.

Incorporating operations entails using traffic engineering projects that can maximize roadway efficiency and address safety. In some communities, operations solutions can be faster to implement and may not require the same degree of environmental impact analysis as new construction. The following issues related to management and operations were identified by the Summit participants and could greatly benefit from research in best practices:

- Transportation system integration and management;
- Jurisdictional cooperation and communication among multiple transportation organizations, law enforcement, emergency response, and media for real-time transportation emergency management;
- Regional operations and resource sharing for project and programming decisions;
- Implementation of performance measures related to customer service, agency accountability, real-time monitoring, results, outcomes over output, and instrumentation (enabling infrastructure) and data; and
- Research and deployment of data collection and use, including technology for data collection, sampling, and simulation modeling to augment system performance data.

5. Continue to fund the Intelligent Transportation Systems (ITS) Research and Deployment program focusing on traffic management center operations, traffic incident management, traffic signal system management, public transit management and advanced traveler information systems.

In this time of uncertainty, continued investment in ITS research and development is critical. ITS plans in metropolitan areas should be updated to incorporate emergency management strategies and to facilitate national security. For example, many metropolitan areas have emergency management organizations, but they may not be integrated with a traffic operations center. Some metropolitan areas, which are vulnerable to hurricanes and other natural and manmade disasters, have evacuation plans and supporting systems, but many do not.

ITS has a role to play in emergency preparedness. ITS components can be instrumental in supporting the establishment of key action plans directly related to evacuation planning and implementation, and emergency vehicle prioritization. Traffic management centers, with their communications and traffic surveillance capabilities, can monitor the status of critical transportation links and can be quickly transformed into command centers for disaster management. Traveler information systems can be used to guide people to safety.

Because of the critical nature of system monitoring to system management and traveler information, ITS research must also include an evaluation of alternative approaches for the development of a comprehensive national traffic and weather-monitoring capability. These approaches should consider alternative organizational frameworks that incorporate both public and private sector participation.

6. Support findings of the Transportation Research Board's Special Report 261, *The Federal Role in Highway Research and Technology*, prepared by the Research and Technology Coordinating Committee of the National Research Council.

The report recommends that the FHWA's R&T program should:

- Invest at least one-quarter of research expenditures in fundamental, long-term research aimed at achieving breakthroughs in the understanding of transportation-related phenomena;
- Allocate approximately one-half of R&T resources focusing on research on significant highway research gaps not addressed in other highway R&T programs and emerging issues with national implications;
- Balance nationwide representation of stakeholders and technical experts in problem identification with technical review through open competition, merit review and systematic evaluation of outcomes to make decisions that reflect a strategic vision for the national transportation system—Congress should provide FHWA with the funding and authorization to meet this need;
- Promote innovation by surveying international research and practice, with the aim of identifying promising technologies, processes, and methods for use in the United States;
- Subject university transportation research funded under the UTC program to the same guidelines of FHWA's R&T program;
- Seek increased funding in its R&T budget—a budget twice the current level would only amount to one percent of the annual total public highway expenditures.

Conclusion

In conclusion, ITE recommends six key areas of research that the Subcommittee on Environment, Technology and Standards should recommend for inclusion in the reauthorized surface transportation bill.

1. Support the program goals and increased funding for the Future Strategic Highway Program.
2. Support increased funding for the Transit Cooperative Research Program.
3. Require focused research on intersection safety and the exchange of lessons learned nationwide.
4. Require the Secretary of Transportation to initiate a study through the National Academy of Sciences to identify best practices of incorporating operations and safety into the planning process.
5. Continue to fund ITS research and deployment with emphasis on system monitoring.
6. Support the Transportation Research Board recommendations for the Federal Highway Administration's Research and Technology Program.

ITE strongly believes that these recommendations are instrumental to ensuring the future safety, reliability and security of the transportation system. ITE appreciates the opportunity to share our views and looks forward to working with you in the future.

STATEMENT OF THE AMERICAN CONCRETE PAVEMENT ASSOCIATION (ACPA), THE NATIONAL ASPHALT PAVEMENT ASSOCIATION (NAPA), AND THE NATIONAL STONE, SAND AND GRAVEL ASSOCIATION (NSSGA)

Introduction

The American Concrete Pavement Association (ACPA), National Asphalt Pavement Association (NAPA), and National Stone, Sand and Gravel Association (NSSGA) appreciate the opportunity to submit this statement concerning Transportation Research and Development.

The members of ACPA, NAPA, and NSSGA supply the materials used to construct our nation's highways, roads, and bridges. Aggregates, asphalt, and concrete provide the foundation—literally—for America's economy, safety, security, and quality of life.

Transportation Research and Development efforts are vital to ensuring America's surface transportation system meets both current and future demands. Without analysis to determine how to make the system and its components better, we will fall short. History shows clearly that when we fail to look ahead, plan, and develop new products and processes through research our nation loses its competitive edge and the public is disadvantaged.

In addition, by not spending money now for research to address identified concerns and create better products, we will end up spending more money in the future to address the same issues. In effect, we will create an unnecessary financial burden and shortchange the public by not doing all we can to provide the best possible transportation system.

Although research is important, even in the best financial times it is often the first, or one of the first, areas to be considered for no funding increase or a funding cut as policy-makers decide how to allocate limited resources among competing priorities. With a federal budget deficit, pressure to cut research funding may be even greater than usual.

As such, it is imperative that industry work with Congress to support and justify Transportation Research and Development programs. ACPA, NAPA, and NSSGA are committed to this effort and ensuring that these programs are adequately funded.

As we move forward with reauthorization, it is instructive to remember that one of the five significant features of the Transportation Equity Act for the 21st Century (TEA-21) was investing in applied research and its application. We must continue this emphasis.

Pavement Research and Technology Program

ACPA, NAPA, and NSSGA have come together to develop our proposed Pavement Research and Technology Program. We believe this program provides the most effective framework for ensuring that pavement research addresses the most pressing needs with full accountability to Congress and the public.

This program would:

1. Involve stakeholders, including the Federal Highway Administration, State Departments of Transportation, pavement industry representatives, and other experts such as the Transportation Research Board and academicians.
2. Develop specific pavement research priorities.
3. Provide for important research-related activities such as technology transfer and deployment, education and training, and performance evaluation.
4. Ensure accountability that clearly ties research to quantifiable benefits with required reporting to Congress on an annual basis.

The pavement industry is currently without a true national research leader and champion. Pavement research in this country has evolved into a decentralized program that lacks clear vision and is aimed at satisfying many agendas. The result is a tapestry of pavement research, conducted at many levels, with no easily understood mechanism for disseminating the results or providing accountability.

To remedy this problem, our Pavement Research and Technology Program would establish an oversight Committee of stakeholders. Stakeholders would include individuals representing the Federal Highway Administration, State Departments of Transportation, pavement industry representatives and other experts such as the Transportation Research Board and academicians.

The Committee would be responsible for developing specific research priorities and providing the strategic focus for the program. It would also provide programmatic and project level input. To facilitate a more efficient and effective research process, it would also be empowered to make recommendations concerning

awarding grants and contracts, and entering into cooperative agreements. We would emphasize that program participation would be open to all qualified entities in a fair and open manner.

Our program would strengthen the linkage of research to technology development, education, and training. To do this, we recommend allocating a least \$1.5 million per year under the program for education, training and technology transfer at universities and colleges. This funding would be used, for example, to encourage civil engineering programs to emphasize pavement technologies, which are too often left out of required courses.

It is in the public interest to make sure that the research program we are proposing is transparent and accountable. We must be able to explain to the Congress and the public what is being achieved for the funding being spent on pavement research. We are, therefore, recommending under our program that the Pavement Research and Technology Committee report annually to Congress on what is being accomplished under the program and how it ties to the vision set forth by Congress.

The investment level in our proposed program should be tied to the overall funding level of the next reauthorization legislation. The current federal investment in highway research, as a share of highway expenditures, is five-tenths of one percent. This is substantially lower than the research budget for firms in low-tech industries. It is also inadequate given the 13,000 fatalities that occur each year on U.S. roads due to unacceptable pavement conditions. A \$95 million annual funding level for the Pavement Research and Technology Program would be a modest investment when weighed against the tremendous social and economic costs resulting from these deaths. This, of course, does not begin to cover the true "costs" due to related injuries.

A pavement research program functioning under the framework outlined in our proposal would result in the efficient delivery of timely and effective research products, processes and traffic management systems that are readily discernible, quantifiable, and truly beneficial to America's road users. The Federal Government, contractors, owners, and academia, working together with a defined mission would maximize the federal investment in pavement research, and lead to a stronger highway network that meets the growing demands of the traveling public.

The best way to ensure our success is to cooperate and use our combined knowledge and resources to develop a comprehensive program that provides for pavement research across a number of areas to the ultimate benefit of the public. We believe our Pavement Research and Technology Program does just that.

We have attached a copy of our suggested legislative language to implement the Pavement Research and Technology Program and would be happy to provide any additional information that the Committee may require.

Attachment**Pavement Research and Technology Program**

IN GENERAL—The Secretary of Transportation shall establish a Pavement Research and Technology Program in accordance with this section.

(a) ESTABLISHMENT—Not later than 90 days after enactment of this Act, the Secretary of Transportation shall establish a Pavement Research and Technology Program to award grants, enter into cooperative agreements, or award contracts to qualified institutions to conduct research; technology transfer and deployment; education and training; and performance evaluation to improve asphalt pavement, concrete pavement, and aggregates used in the National Highway System.

(b) RESEARCH PRIORITIES—The members of the Pavement Research and Technology Committee, in consultation with the Secretary of Transportation, shall review past research, assess current research efforts, and not later than 120 days after enactment of this Act, develop specific research priorities to provide the strategic focus of the Pavement Research and Technology Program established under subsection (a).

(c) COMMITTEE—Not later than 90 days after enactment of this Act, the Secretary of Transportation shall establish a committee to be referred to as the Pavement Research and Technology Committee.

(d) DUTIES—The Secretary of Transportation shall consult with the Committee and make recommendations on matters involving or relating to pavement and aggregates research. The Committee shall consult with, and make recommendations to, the Secretary of Transportation concerning awarding grants, entering into cooperative agreements, and entering into contracts for such research.

(e) COMPOSITION AND APPOINTMENT—The Committee shall be composed of 12 members appointed by the Secretary as follows:

- (1) Three (3) members appointed from among individuals representing the United States Government.
- (2) Three (3) members appointed from among individuals who are especially qualified to serve on the committee because of their education, training or experience, and who are not officers or employees of the United States Government.
- (3) Three (3) members appointed from groups outside the Government that represent the interests of pavement organizations.
- (4) Three (3) members appointed from state Departments of Transportation, each representing a different geographic region of the United States.

(f) FUNDING—The Secretary of Transportation shall obligate from the Highway Trust Fund \$95 million for each of fiscal years 2004 through 2009 to carry out activities under this section.

(g) ALLOCATIONS—Of the amount made available under this section:

- (1) \$45 million for each of the fiscal years 2004 through 2009 shall be made available for applied asphalt pavement research;
- (2) \$45 million for each of the fiscal years 2004 through 2009 shall be made available for applied concrete pavement research; and
- (3) \$5 million for each of the fiscal years 2004 through 2009 shall be made available for applied aggregates research.

(h) TRAINING AND EDUCATION—Of the funding provided under this provision, a minimum of \$500,000 per year from each category shall be used for education, training, and technology transfer at universities and colleges through undergraduate curriculum.

(i) ADMINISTRATIVE—The Pavement Research and Technology Committee, in consultation with the Secretary of Transportation, shall establish the positions of recording secretary and financial officer to assist the Committee. The recording secretary will generally be responsible for the administrative requirements set forth by the Committee. The financial officer shall be responsible for overseeing the program's acquisition requirements, including, but not limited to, procuring research; administering grants, cooperative agreements, and contracts; reporting research results; and performing other duties, as appropriate.

(j) **REPORT**—Not later than 12 months after the date of enactment of this Act, and annually thereafter, the Secretary of Transportation shall submit to the Committee on Environment and Public Works of the Senate, and the Committee on Transportation and Infrastructure and the Committee on Science of the House of Representatives a report on the progress and results of activities carried out under this section.

REPORT LANGUAGE—Congress finds that the National Highway System (NHS), established in the Intermodal Surface Transportation Equity Act of 1992 (ISTEA) is crucial to the Nation's security, economy and quality of life. The Interstate Highway System, the backbone of the NHS, was built in the 1960s and 1970s and is approaching or exceeding its design life, as are many other sections of the NHS. In addition, significant portions of the NHS are carrying traffic that far exceeds their design capacity.

The purpose of this section is to develop new technologies through federal research necessary to provide a safer and more cost-effective surface transportation system that improves mobility, lasts longer, and can be maintained more efficiently and effectively. In addition, research is needed to explore the feasibility of designing and constructing dedicated truck-only lanes to facilitate freight transportation on the NHS and improve intermodal transportation networks.

This section requires the Secretary of Transportation to establish a Pavement Research and Technology Program to award grants, enter into cooperative agreements, or award contracts to qualified institutions for conducting research to improve pavements.

A Pavement Research and Technology Committee shall be established to provide strategic, programmatic, and project level stakeholder input to the Pavement Research and Technology Program. Funding under this section shall be used for conducting research; technology transfer and deployment; education and training; and performance evaluation to improve asphalt pavement, concrete pavement, and aggregates used in the NHS.

STATEMENT OF THE AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

APTA is a nonprofit international association of over 1,500 public and private member organizations including transit systems and commuter rail operators; planning, design, construction and finance firms; product and service providers; academic institutions; transit associations and state departments of transportation. APTA members serve the public interest by providing safe, efficient and economical transit services and products. Over ninety percent of persons using public transportation in the United States and Canada are served by APTA members.

INTRODUCTION

Mr. Chairman and members of the subcommittee, on behalf of the American Public Transportation Association, thank you for this opportunity to speak to you about the federal public transportation research and training programs as they pertain to the reauthorization of TEA-21.

ABOUT APTA

APTA's more than 1,500 member organizations serve the public interest by providing safe, efficient, and economical public transportation service, and by working to ensure that transit products and services support national energy, environmental, community, and economic goals. APTA public and private member organizations include transit systems; commuter railroads; design, construction, and finance firms; product and service providers; academic institutions; and state associations and departments of transportation. More than ninety percent of the people who use public transportation in the United States and Canada are served by APTA member systems.

APTA'S REAUTHORIZATION PROPOSAL ON RESEARCH AND TRAINING

Mr. Chairman, the federal transit research and training programs have been invaluable to our members and the transportation community as a whole. Funding for these five programs needs to be increased in the reauthorization of TEA-21. Federal investment in research and technology enables our systems to operate more efficiently and safely while growing ridership and allows U.S. goods and services to become more competitive in the global marketplace. Without research and training, innovation withers and American jobs are lost offshore. Investment in the International Mass Transportation Program, for example, helps promote American transit products and services overseas, and affords opportunities for American vendors to showcase their products and services. Other types of research and assistance provide tools and information to transit agencies as they continue their efforts to increase ridership on their systems. In short, the several DOT sponsored research programs help provide a solid foundation and a guiding light in fostering innovation and growth in the transit industry.

The Transit Cooperative Research Program, National Transit Institute, National Planning and Research (including Project Action), Rural Transportation Assistance, and University Transportation Research programs have helped the industry reduce costs, increase productivity and enhance operations. Unfortunately, funding for these federal transit research programs has had very limited growth over the past decade. This means that the transit research program has lost purchasing power to inflation even as the needs have grown, thus unduly stretching these limited resources.

APTA has included the federal transit research and training programs in its recommendations for the reauthorization of TEA-21. Our proposal advocates providing for a one-time adjustment in Fiscal Year 2004 to take the overall funding level to \$73.59 million which will help restore the lost purchasing power of these programs during the TEA-21 authorization period. APTA proposes to increase research and training funding and to provide for annual increases until funding reaches approximately \$132 million in Fiscal Year 2009.

Because these programs are so valuable to the transit industry and the transportation community as a whole, I think it would be useful to provide for the committee some background on some of the research programs and provide for you APTA's recommendations for their future.

TRANSIT COOPERATIVE RESEARCH PROGRAM (TCRP)

A key component of FTA's research program is the Transit Cooperative Research Program (TCRP). The Transit Cooperative Research Program was created under ISTEA in 1991 and reauthorized under TEA-21 in 1998. It was created in response to strong demand for ideas and applied solutions to the everyday issues associated with delivering transit services effectively and efficiently, and to bring innovation to the industry. It is modeled after the highly successful National Cooperative High-

way Research Program (NCHRP). TCRP is run cooperatively by the Transportation Research Board, the Transit Development Corporation (an affiliate of APTA), and FTA. It was the intent of the legislation that created this program that it be operated by an independent governing board, a system that continues today and that has worked very well.

Research under TCRP is undertaken by researchers selected through a competitive process. Oversight panels provide the necessary peer-review to assure that the contracted research is on target with the industry's problem solving need. Once the research is completed, the TCRP in cooperation with APTA, disseminates the information to transit agencies, service providers, equipment manufacturers, and suppliers, the academic community and others. This is done through periodic reports, workshops, and other training aids. According to a recent report, the TCRP has commissioned 346 projects, and completed 247 published studies to date. These projects are divided into eight categories, including operations; service configuration; engineering of vehicles and equipment; engineering of fixed facilities; maintenance; human resources; administration; and policy and planning.

TCRP research has produced many success stories. One study on low-floor light rail vehicles helped Santa Clara County, California save \$20 million in costs associated with Americans with Disabilities Act compliance for its new light rail system. Another study is being used by bus systems around the country as they consider purchasing environmentally friendly hybrid-electric transit buses. A TCRP project that seeks to develop uniform technical standards for rail vehicle systems has saved New Jersey Transit \$420,000 a year in procurement costs. TCRP Report number 54 "Management Toolkit for Rural and Small Urban Transportation Systems" identifies management principles and techniques for effectively operating transit systems in rural and small urban areas and is being used successfully by the West Virginia Division of Public Transit, among others. Over \$2.3 million has been committed since 9/11/01 on fourteen projects to improve the security readiness of the Nation's transit systems. Other reports and studies are being used as training manuals or standard operating procedures for several transit projects, welfare-to-work programs, public information activities, intelligent buses and railcars, and more.

All of this is done on an annual budget of \$8.25 million, which is the same level of funding the program received when it was created in 1991. In comparison, NCHRP—the sister program of TCRP—is currently funded at approximately \$30 million, with funding levels rising with annual increases in the federal highway program. Had TCRP funding been pegged to the size of the federal investment in transit, which has grown through the ISTEA and TEA-21 years, current TCRP funding would be approximately \$17 million instead of \$8.25 million.

With more federal investment, this program can do even more to save taxpayer dollars and better serve transit customers. Therefore, APTA recommends that this program receive \$13.75 million in Fiscal Year 2004 and annual increases to almost \$27.93 million in 2009.

Candidate projects for TCRP funding are selected by a diverse, twenty-five member TCRP Oversight and Project Selection (TOPS) Committee. The TOPS Committee consists of a broad array of industry interests, public and private, as well as academics. It functions as the TCRP governing board and sets research priorities in accordance with the needs identified by the transit industry itself. In comparison, NCHRP comes under FHWA's State Planning and Research program (SPR). The SPR funds are apportioned to the fifty states. The states, in turn, commit a portion of their SPR funds to support the NCHRP program, by voluntarily signing annual agreements with the National Academy of Sciences committing the funds. The states recommend projects to be selected. Comparison of these two funding models shows that the NCHRP program has been insulated from the pressures associated with the federal budget process, while the TCRP program has been subject to Congressional earmarking and to the undue influence of FTA in the project selection process.

UNIVERSITY TRANSPORTATION RESEARCH

Innovation resulting from the latest knowledge and a well-educated and well-trained transportation work force is key to improving mobility. As a country we must develop new transportation leaders and researchers, and assure the development of the most advanced and productive transportation technologies. Universities can play a critical role in this regard.

National benefits in this regard are achieved through the University Transportation Centers Program (UTC), and through the University Transportation Institutes. APTA strongly supports the continuation and growth of these programs.

By forming a working relationship with universities, the transit industry and the FTA are able to create a link with the academic community in providing an open forum for problem solving and intellectual discourse.

As with the TCRP, the UTCB budget has remained flat at the \$6 million level since 1993. APTA recommends a \$10.5 million investment in this program in Fiscal Year 2004 and annual increases to \$21.9 million in Fiscal Year 2009.

NATIONAL PROGRAM OF TRANSIT PLANNING AND RESEARCH

The National Program of Transit Planning and Research, or TPR, is the FTA's primary program for TPR data collection and analysis, and technical assistance to the transit industry. TPR addresses challenges and opportunities that are national in scope including safety, security, mobility, fuel efficiency, clean air, and global trade. It includes research, development, testing and information transfer of innovative transit technologies and services. One of the most successful efforts has been *Easter Seals Project ACTION*, an initiative first commissioned by Congress in 1988 to promote cooperation between the transportation industry and the disability community to increase mobility for people with disabilities under the ADA and beyond.

APTA works closely with FTA Administrator Dom and her team on a number of important issues, including safety and security, intelligent transportation systems, and setting voluntary standards for the transit industry. Unfortunately, FTA often has little discretion in which projects to undertake as nearly all funds are Congressionally directed. The effectiveness of the national research program would be enhanced if the program were made less susceptible to earmarking.

APTA recommends funding this program at \$36.2 million in Fiscal Year 2004, with annual increases to \$57.5 million in Fiscal Year 2009.

NATIONAL TRANSIT INSTITUTE

The National Transit Institute (NTI) was established in 1992. It is based at Rutgers University and, like the TCRP, is modeled after a successful highway program, FHWA's National Highway Institute. The NTI serves the training and staff development needs of the transit industry's workforce. It offers courses and seminars in a number of FTA offices in several policy areas including procurement, program management, and planning. The overall goal of the NTI is to help the transit industry attract and develop employees who are productive and technically competent.

Like other programs mentioned previously, the investment in this program has remained relatively flat, receiving only a \$1 million increase after Fiscal Year 1998 to \$4 million annually. APTA recommends increasing this to just over \$5 million in the next fiscal year and providing increases in investment up to \$8.9 million in Fiscal Year 2009.

RURAL TRANSIT ASSISTANCE PROGRAM

Significant training and technical assistance services to promote delivery of safe and effective public transportation services in rural areas are provided through the Rural Transit Assistance Program (RTAP). APTA recommends that the RTAP program be funded at \$7.94 million in FY 2004, growing to a level of \$15.33 million in FY 2009.

APTA RESEARCH AND TECHNOLOGY STRATEGIC PLAN

Before closing, Mr. Chairman, I would like briefly to note that the transit industry through APTA has developed a strategic plan on research and technology. Our plan will address five key areas: safety; technology; workforce development; transit in the community; and market development. We look forward to briefing the Committee on the plan in the future, and working with FTA on its implementation.

CONCLUSION

In closing, I want to express my appreciation for the opportunity to testify before you today. Investment in these important research programs is a cost-effective way to ensure that our nation's transit infrastructure is safe, modern, efficiently run and competently operated. When our transit network operates in this fashion, transit best serves our communities by serving as an important part of an integrated, multi-modal transportation system that gets and puts people to work, protects the environment, and moves goods and services. APTA recommends that Congress recognize the role transit research plays by increasing its investment in these programs. Mr. Chairman, we thank you for considering our views.

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INVESTING IN TRANSPORTATION, EDUCATION, AND RESEARCH

The Source of Intellectual Capital,
Knowledge, and Innovation in
Transportation

A position paper of the Strategic Alliance
for the Advancement of Transportation



The Case for Transportation, Education, and Research

Research: A Fundamental Element of Transportation

At no time in American and international history has transportation been so critical to our society. We face daunting transportation challenges, and, yet, we also have exciting opportunities to explore.

Improvements can and must be made in mobility, safety and efficiency of the nation's transportation systems. Leaders, educators and innovators in transportation research and education are ready and willing to contribute during these extraordinary times.

To achieve these aims, the Strategic Alliance for the Advancement of Transportation supports a significant increase in funding for the development of human capital, knowledge and innovation in transportation through the re-authorization of TEA-21.

Acknowledgment of the importance of transportation issues in today's world comes from Secretary of Transportation Norman Y. Mineta, who recently said, "During the last 35 years, Americans have come to appreciate the power of transportation to serve as an engine for building prosperity. Across every mode, transportation provides the underpinnings for our economy and improves our daily lives."

"Transportation policy is about more than public works; it's about moving people safely and seamlessly, and moving goods efficiently and dependably. When properly managed, transportation policy binds people and communities across regional and national boundaries, opening doors and opening possibilities – truly a noble endeavor."

Mineta added, "America's entire transportation sector once again faces a period of extraordinary challenge. Last September, a determined and remorseless enemy, unconstrained by law or morality, attacked one of America's most cherished freedoms, the freedom of mobility."

Role of Federal Funding for Transportation Research and Education

The Alliance, comprised of several national transportation organizations, agrees wholeheartedly with the Secretary's assessment. Each of its members plays a vital and active role in the nation's transportation system.

"Research is crucial to advances in transportation that can save lives, time and money. Just as important is work force development through training and technical assistance."

– John Horsley, AASHTO

The American Association of State Highway and Transportation Officials (AASHTO), encourages maintaining a funding commitment to national research. The American Road and Transportation Builders Association (ARTBA) supports building the nation's knowledge base through grants and awards to students who tackle transportation issues. The American Public Transportation Association (APTA) calls work force development one of the public transportation industry's most critical problems and sees a tremendous need for a skilled work force to

"Our nation's economic vitality demands a transportation professional with a strong undergraduate and graduate educational foundation with a commitment to and with access to ongoing professional development. Ongoing research programs at the universities responsible for the education of the professional enhance the educational experience as well as contribute innovation toward addressing today's and tomorrow's mobility and safety needs."

– Tom Brahms, ITE

move people efficiently and safely. The Council of University Transportation Centers (CUTC) actively works with campuses to strengthen the transportation work force with graduates committed to innovation and excellence in transportation. And the Institute of Transportation Engineers (ITE), an educational and scientific association of traffic engineers, transportation planners and other professionals, is keenly aware of the need to add to the stock of intellectual capital.

These organizations believe that the expansion of research in the re-authorization of TEA-21 is supported by several fundamental positions, including:

- The documented needs for transportation research and education are substantial.
- There is an appropriate federal role in funding transportation research.
- Federal investment in transportation research has been inadequate to meet the needs.
- Additional research funding is needed to address issues associated with all modes, and with modal interfaces.
- University research, both applied and basic, has a proven track record and should remain a key part of federal transportation research programs.
- Work force development is a major concern, which is supported by research funding; and universities are a large part of the solution.

"The necessary reconstruction and expansion of the nation's transportation infrastructure in the years ahead will require innovative thinking on technologies and materials. A greater investment in research and a strong effort to capture the imagination of America's youth are critical to meeting these challenges."

— Peter Ruane, ARTBA

The Return on Research Investment

Adequately funding transportation education and research can decisively add to the value of the United States' transportation and logistics system. The need is best exemplified by several challenges common to all states: the increasing congestion in cities, both

"Absent research initiatives, innovation withers and jobs are lost. America's transportation industries, systems, and practitioners, a huge component of our economy, need to be infused with new ideas and problem-solving techniques."

— Bill Millar, APTA

large and small, that causes lost time and productivity; more than 40,000 deaths and countless injuries on our highway system resulting in immeasurable loss and heartbreak; the increasing dependence of the economy on truck freight; and the increasing demand for public transportation. Further, transportation's relationship to the environment and homeland security are of paramount importance. These issues cannot be resolved without the appropriate investment in research and intellectual capital to apply new knowledge.

Underpinning the importance of transportation-related research and education are four fundamental principles. They include the importance of mobility to socioeconomic success; the role of innovation in economic growth; the evolution of a knowledge-based economy and society; and the function of intellectual capital in knitting the first three principles together.

A Key to Socioeconomic Success

Mobility is vital to economic success and the advancement of our society. With mobility, comes specialization and trade that lead to economic efficiency and growth. It allows for moving people, raw materials and finished products effectively to factories, offices and stores. And personal mobility provides democratic and social opportunities for individuals.

Knowledge Creation and Innovation Foster Growth

Improved mobility is necessary as the United States works to maintain its position as an economic and political world leader. In today's global marketplace, improving mobility is a major component in the

competitive strategies of many other countries. Additionally, better mobility is key to increasing productivity and the quality of life domestically. The Alliance believes the improvements can come only through America staying at the leading edge of transportation education, knowledge creation and the resulting innovation.

Innovation has been a critical component of the spectacular economic growth of capitalistic countries during the 20th Century. The development was a product of individual firms competing for business by improving products and services in a market environment that required them to continually offer better value and enhanced or new products.

However, many transportation sectors are part of a planned economy and limited budgets lead to underinvestment in research. In areas such as infrastructure, transit systems, many of the modal industries and other elements of transportation, there is a scarcity of knowledge development, innovation and development of highly specialized intellectual capital.

Thus, the government needs to be the catalyst for the resources necessary for innovation in the transportation system.

The Rise of a Knowledge-Based Economy

The Alliance believes this is particularly crucial for the United States. The rate of innovation must be increased in the transportation sector to keep pace with other sectors to prevent it from becoming a bottleneck that hinders continued economic growth.

The feedstock for the innovation process is a base of knowledge that doubles every three to seven years. This knowledge, which creates the basis for innovation, must continually be developed for the United States to remain competitive and continue to improve mobility.

America's business community is becoming more dependent on a knowledge-based economy with increased reliance on the knowledge workers who constitute the intellectual capital base of our economy. The intellectual capital base must continually be added to, in order for it to continue to grow and the innovation process to move forward.

"Our transportation system must undergo major transformations to help ensure economic competitiveness and quality of life. This will require rapid and sustained technology development and a highly trained workforce. A strong national research program is essential to making this happen."

— Dennis Christiansen, CUTC

The continued development of highly specialized transportation-related knowledge workers is a necessary condition for a better economy. They educate and train the future knowledge workers, and create the discovery that leads to the development of knowledge necessary for innovation to occur. Knowl-

edge workers also are critical to building and operating the transportation system and developing the system's components. Further, they are the ones who will implement the innovations that come on stream.

Our Transportation Future Depends on Research

Universities are uniquely qualified to make a critical contribution to transportation through the development of the intellectual capital base, the discovery of knowledge and the innovation that springs from the application of knowledge. The university environment provides an excellent venue to enrich transportation because of its place in the American social and economic fabric. The challenge is to develop an adequate funding base to take advantage of this tremendous opportunity to improve mobility.

The Alliance and its individual members (AASHTO, APTA, ARTBA, CUTC and ITE) encourage the federal government to provide the necessary resources through the re-authorization of TEA-21 for the development of knowledge, innovation and intellectual capital for improving mobility, safety and transportation efficiency in the United States.

STATEMENT OF ELIZABETH DEAKIN
UNIVERSITY OF CALIFORNIA, BERKELEY

Emerging Trends and Policy Choices: Research Needs for Consideration in TEA-21 Reauthorization

Thank you for this opportunity to comment on research in transportation needed over the next several years. I am a professor of transportation planning and policy at UC-Berkeley and director of the UC Transportation Center, which funds research on any and all of the nine UC campuses. I will address my comments to major demographic, economic, and environmental issues that will shape transportation over the next two decades and the research we will need to conduct if we are to meet the goals of mobility, safety, economic vitality, system preservation, and environmental protection that Congress has set forth in TEA-21.

Trends and Policy Choices

Ten trends and policy choices pose significant challenges for transportation. They are:

1. A Growing Population
2. Demographic Change
3. New Patterns of Employment and Economic Production
4. Changing Location Patterns
5. Changing Passenger and Household Travel Demand
6. Changing Patterns of Freight Transport
7. Emerging Technologies
8. Concern for the Environment
9. Equity and Participation
10. The Finance Dilemma

These trends and choices in turn raise important research needs, ranging from a need to improve our basic understanding of underlying processes to a need for evaluation research on alternative policy options and program approaches. Research in each of these areas would pay off in a transportation system that is more efficient, economically productive, environmentally sound, and equitable.

1. A Growing Population

The U.S. population continues to expand more rapidly than that of most other developed countries, and this scaling up of the population will affect every aspect of life, from jobs and housing markets, to demands for public infrastructure and services, to access for open space. Population growth will not be even; some states are expected to see little population change overall, while others, especially the states of the South and West, will grow rapidly. In my home state of California, for example, the population is expected to increase by 20 million or more by 2020, to a total of 45 million.

Population growth also will not be even within the states. Most states will see growth concentrated in metropolitan areas, and within those areas, growth will frequently occur fastest at the metropolitan fringe. Again using California as an example, just eight counties—Los Angeles, San Bernardino, Riverside, Orange, San Diego, Alameda, Contra Costa and Santa Clara—are forecast to account for more than 60 percent of the State's total population growth over the next 20 years. From a regional perspective, the two largest metropolitan areas, Los Angeles/South Coast and the San Francisco Bay Area, will account for the majority of the state's growth.

Managing the increased demands for transportation will require not investment in new and improved facilities and services. But to make those investments wisely, we need to better understand how growth will affect demand patterns—across the modes and for both passenger and freight transport. We also need creative exploration of how best to use planning, technology, operations, and management to move people and goods efficiently and in ways that are supportive of the high quality of life we all want and expect.

2. Demographic Change

Along with the rising size of the population, its composition is also expected to change over the next 25 years. One of the most important changes for most states and metropolitan areas will be the increase in the share of persons over 65 years of age, as the large Baby Boomer generation reaches senior citizen status. Among

these seniors, the fastest growing group will be people over 80. These older Americans will face declining vision and physical mobility, but they will still be active and most will still be driving.

The need for strategies to support the travel needs of older Americans while providing safety for everyone is already pressing and research to date has only begun to understand the issues and possible responses.

In the fast growing states the share of the population under 18 also will increase. For example, in California, the population under 18 will increase by about 37 percent, compared to a 30 percent increase overall. These younger Americans have busy schedules at school and after school, but they cannot drive, for the most part, and in many areas the school bus transportation that gave their parents a ride is no longer available or is too limited to meet the needs of working parents. Thus parents provide most of their children's transportation, often with some difficulty given work schedules and other household responsibilities. Improved transit, walking and bicycling options offer promise for better, safer, more secure transportation for kids, but here too we have barely scratched the surface in understanding the needs and looking for solutions.

3. New Patterns of Employment

Changes in the economy have significantly altered patterns of employment in the U.S. over the past twenty years: Global trading, newly developing market links with South Asia, growth in high-tech industries, and e-commerce are just a few of the changes that have altered the size, scope, and location of work. Trends and forecasts suggest that changes over the next two decades will be equally significant.

Among all industries, services are the fastest growing, though there are state and metropolitan differences in their relative importance. In California, services are expected to account for one job in three by 2008, with a large increases in jobs at both the low end of the pay scale (<\$30,000 per year) and at the high end (>\$100,000 per year). Like population growth, employment growth is expected to be heavily concentrated in metropolitan areas, and within the metro areas, it is likely to be located largely (though not entirely) in outlying regional sub-centers, where comparatively sparse transportation networks now exist. Handling the transportation needs in these new growth areas remains a challenge and research is needed to explore the possible application of new technologies, new operations and management systems, and new land use-transportation coordination concepts.

Unemployment is often thought of as an inner city problem but concentrations of unemployment also arise in older suburbs and in rural areas. Research on welfare to work, reverse commute services have paid off in identifying strategies that help people find and keep employment, but here too more work will be needed as employment shifts continue.

4. Changing Location Patterns

Shifts in location of employment and population and continuing trends toward decentralization reflect complex interactions of land markets, development constraints, and personal and corporate preferences. Land availability and affordability are two interrelated factors that could have major impacts on location choices and travel patterns over the next decades.

The availability of land for development is determined not only by physical suitability (e.g., floodplains and slide zones might be considered unsuitable or too costly for housing development), but also by local government policies on land protection, subdivision control, zoning, and development fees and exactions. Where land availability is restricted, land and housing prices (as well as commercial development prices) tend to be pushed upward. In such cases developers turn their attention to neighboring jurisdictions with fewer restrictions. Such spillover appears to be happening in many of the major metropolitan areas of the U.S. One result is a growth in commuting across metropolitan borders, with long commutes especially for first time home buyers. Another result is the loss of farmland and habitat in the outlying areas.

Some metropolitan areas and a handful of states are attempting to redirect growth to existing urban and suburban communities through strategic investments in infrastructure, including highways and transit, as well as through policy interventions such as fast-track approval for infill housing, transit-oriented development incentives, public-private development partnerships, and urban growth boundaries. The efficacy of the various strategies has received research attention in the last few years but findings are still tentative and conflicting. Much more work remains to be done.

5. Changing Patterns of Personal and Household Travel

Profound changes in personal and household travel have occurred over the past two or three decades, and these changes have important implications for future transportation planning. Among the most important changes are the growth in travel not related to the journey to work and the heavy increase in auto ownership and use.

During the period from 1969 to 1995, work-related travel fell from 36 percent to 18 percent of all trips nationally. To some extent this reflects accounting as well as behavior; a trip home from work with a side stop at the store is counted as a trip from work to store plus a second trip from store to home. Nevertheless, the growth in non-work travel to 82 percent of all trips nationally does reflect the complexity of travel and of American's busy lives.

The growth in non-work activities is a key factor in the rapid increases in per capita and per household VMT, since these non-work activities are disproportionately made by car. Growth in auto use also reflects increasing levels of driver licenses among both men and women, a willingness to continue to drive well into old age, near-ubiquitous auto availability, the location of activities in the suburbs in patterns that depend on the car for access, and the ease and convenience of auto trips in comparison to most other travel options. Transit, in the meantime, has lost market share overall, although gains have been seen in some markets. Transit use is especially prevalent among lower income households in urban areas and among new arrivals to the U.S.

Understanding consumers' travel patterns is a critical first step in developing good transport services and is especially critical when considering policies that are intended to alter travel choices (e.g., bus rapid transit, employer transit pass subsidy programs, parking charges or discounts). Unfortunately, many metropolitan areas are hampered by a lack of data. National data sets are too sparse to provide usable data for metropolitan planning unless the metro area has paid for a larger sample; many areas have lacked the resources or foresight to do so. Thus this is an area where not only is more research needed, but better data must be developed to support the research.

6. Changing Patterns of Freight Transport

Freight transportation is critical to the economy but remains almost hidden from sight in most surface transportation policy arenas. Both trucking and rail freight have undergone changes of revolutionary proportions over the last three decades. Deregulation was coupled first with containerization and consolidation innovations and then with just-in-time production processes and advanced logistics systems. Partly reflecting these changes and partly reflecting the changes in the Nation's economy and patterns of growth, trucking has gained market share for intercity transport, especially for higher-value shipments; trucking dominates urban goods movements. Rail continues to carry bulky and lower value items and has captured a significant market share in some areas by handling multimodal shipments. Air freight has also grown, as has intermodal truck-air transport. Water ports have been heavily affected by shifts in U.S. trade partners as well as by the rapid growth in ship size. Security concerns and the disruption caused by terrorism and the threats of terrorism have pointed out vulnerabilities in current practices and point to the need for re-evaluation of current practices.

Work is needed to understand how changing patterns of economic activity, changing production processes, and changing patterns of demand affect freight transport. Work also is needed to help manage the costs, efficiency, safety and security of the freight modes. Yet freight data are hard to come by and the size and quality of available data sets are not always sufficient—better data and more research are both needed.

7. New Technologies

Electronics and telecommunications innovations are transforming social and economic activity, with major implications for transportation. Just-in-time delivery requirements, for example, have revolutionized logistics (and vice versa), with major impacts on businesses, from manufacturing to warehousing to retail sales. Transportation also is being changed by new technologies, as Intelligent Transportation Systems (including smart cards, on-board diagnostics and information systems, and smarter highways, transit, automobiles, logistics systems, and other information systems) are being implemented.

Technological changes over the next two decades could change transportation system user choices and behavior in important ways. Location of businesses and households may be altered as telecommunications options improve. Already, there is evidence that businesses have become less dependent on proximate locations as elec-

tronic links have become more effective alternatives to face to face communications. Freight carriers are heavy investors in new technologies and are using them to more efficiently implement the just-in-time, overnight, and same day services that are proliferating. Individual travelers are also using new technologies to pay tolls more conveniently and to find the best route to their destinations. And while full-time telecommuting is relatively rare today, telecommunications systems do appear to enable many workers to “commute” from a home office on a part-time basis.

The range of options and their impacts will continue to expand as new technologies are introduced over the next two decades, and may alter transportation systems in many ways, large and small. For example, electric or hybrid electric-petroleum vehicles may be introduced that would substantially alter emissions and fuel characteristics of the fleet, and potentially pose challenges in terms of system operations and finance. Smart card technologies could greatly improve the feasibility and convenience of a variety of pricing options for road use, parking, and transit fares. Monitoring and information systems could enable travelers to time trips and select routes to avoid congestion, reducing it in the process. Advanced traffic management systems could increase road capacity significantly while improving safety and respecting other objectives such as pedestrian comfort.

There is a clear need for more research on new technologies—extending from vehicles and fuels to pavements and structures to operations and management. In addition, more work is needed on demand for new technologies and on institutions, policies, and organizational design for their planning and deployment. Whether and to what extent new technologies become significant elements of the transportation systems will depend not only on technological developments but on both public and private decisions about the technologies’ desirability and usefulness. Too often, new technologies are the “hammer” to which everything looks like a “nail.” In addition, most new technologies must be integrated into existing systems (hard and soft), so understanding of implementation pathways, incentives and disincentives, and new approaches for partnerships and collaboration are equally important as part of the technology implementation research agenda.

8. Concern for the Environment

Transportation impacts on the natural and built environment are increasingly important factors in transportation decision-making. Environmental considerations both constrain transportation actions and offer important possibilities for environmental enhancement. Over the next two decades, key environmental considerations that transportation agencies will need to address in future planning and project development include:

- air quality
- water quality
- protection of wetlands
- protection of parks, historic sites, and other cultural resources
- conservation of farmlands and other special lands
- protection and enhancement of scenic views
- protection of endangered and threatened species and their habitats
- enhancement of roadside ecology and reduction of severance effects, streambed effects, etc.
- noise reduction; noise management
- reduction of negative community impacts such as neighborhood traffic
- reduction of solid waste and hazardous waste generation
- recycling and use of recycled and other “green” materials
- reduction of CO₂ and other greenhouse gas emissions.

The Nation has made substantial progress on some of these matters, but much more remains to be done. For example, largely due to technological improvements in vehicle emissions controls and regulation of industrial sources, air pollution has been substantially reduced nationwide, even with substantial growth in activity. However, recent research suggests that we need to know much more about the toxicity and relative potency of various air pollutants, about air pollution modeling and forecasting, about “modal” emissions—how emissions vary with speed, stops, accelerations, etc.—and about the costs and benefits of various emissions control strategies.

Similarly, progress has been made and there is reason to believe that we can further improve water quality, wetlands protection, habitat, and general ecological health through careful design/redesign, construction, and management of transport

facilities. However, to accomplish this, more research is needed on issues ranging from ecosystem-scale impacts and opportunities presented by road systems to better understanding of how road chemicals affect plants and wildlife. In addition, land use itself is increasingly seen as an environmental issue. Among the topics of salience are the effects of transportation investments on the use of land, including induced demand, support of infill and other private investments, and the effects of land use patterns on travel demand (e.g., sprawl and auto dependence; jobs-housing imbalance and congestion; compact growth as a means of facilitating walking, biking, and transit use). All of these areas require research support.

Increasingly, transportation agencies are responding to environmental challenges by redesigning their planning and project development procedures to incorporate environmental considerations early in the process. Many transportation agencies are working more cooperatively with environmental and resource agencies and local governments. Detailed environmental databases and the availability of GIS mapping capabilities are important support tools enabling planners to emphasize environmental protection and enhancement through environmentally sensitive design over after-the-fact mitigation. Funding for these databases has been hard to come by but again, without good data, it is very difficult to produce good plans and analyses.

9. Equity and Participation

TEA-21 called for increased opportunity for citizen participation. Reflecting concerns that minority and low income populations are frequently under-represented in public policy forums, directives to increase planning and outreach activities targeted at those groups have been issued. TEA-21's assignment of significant planning and decision authority to metropolitan planning organizations (MPOs), in partnership with state transportation agencies, strongly signaled a shift in federal policy toward an expectation of greater involvement of stakeholders. Federal law and regulations also acknowledge the need to involve both the public and private sector interests (including shippers, freight carriers, port users, etc.) in transportation planning, who also have been under-represented in the past.

TEA-21 also underscored the need for public agencies to identify and address the environmental and socioeconomic effects of their programs, policies, and activities, mandating that transportation planning must be attentive not just to mobility and system preservation but to also to the larger societal goals of equity, safety, economic vitality, and environmental protection. There is a growing consensus, moreover, that social, economic, and environmental goals should not be "handled" through special programs, but in fact should permeate the entire transportation planning process.

How is this being accomplished? There is growing use of new planning approaches that are based on greater stakeholder and community involvement and that are broadly scoped to better address interrelated land use, transportation, and economic investment issues. Public-private partnerships are being tested. In addition, methods for assessing the incidence of impacts on diverse communities and for measuring the performance of transportation plans and projects from an equity perspective are being developed. But far more work remains. We know little about how effective the various planning approaches are in improving transportation choices, increasing customer satisfaction, or improving system performance. Available methods are not well designed to answer the questions about distribution of costs and benefits that are being asked. Impacts of alternative policies and investments on freight transport are poorly understood.

ISTEA and TEA-21 vastly altered the institutional arrangements and policy objectives for surface transportation, but few studies have examined how the new institutional arrangements are performing. What MPOs have done with their new authorities is not well documented or evaluated. Few studies have examined what makes a public-private partnership for transportation planning and deployment a success—or a failure. How to integrate decision-making across disciplines (transport, environment, development) requires more work and best practices need to be identified and documented.

10. The Financing Dilemma

Funding shortfalls for transportation challenge the ability of transportation agencies to provide for the current and projected mobility and access needs of the Nation. The shortfalls are felt at every level of government, for capital projects as well as for operations and maintenance.

Possible ways to address the financing dilemma are to raise the gas tax, expand the use and "transportation capture rate" of other taxes (e.g., sales taxes, property taxes, excise fees), raise fares and fees, and increase private sector provision of transportation infrastructure and services. While these mechanisms are fairly well

understood, there remain opportunities to further develop innovative methods of finance for transportation facilities and services and to find ways to provide transportation better/cheaper/faster. Research also could help identify and understand the conditions under which the public would support higher taxes and fees, and about the benefits as well as the costs of such higher expenditures on transportation.

Getting Research Done

Transportation has been spending a far smaller fraction of its resources on research than have other sectors of the economy. There is some reason to think that the low rates of research expenditure are in part responsible for the lack of innovation in some of our transportation business practice, with continued use of traditional designs, standard materials, longstanding operations approaches, and so on by our transportation agencies. Research needs to be done and disseminated widely in order for new ideas to emerge and take root, for implementation to be widespread. Funding for research is thus an investment in better transportation systems. Funding for the data that are needed to support research is also a critical investment. Data must be available to allow us to evaluate whether we are in fact improving our transportation systems' performance on mobility, safety, economic vitality, system preservation, and environmental protection, and must be sufficient to allow metropolitan and state decision-makers to evaluate their programs. Data scaled only to the national level are of limited use for these purposes.

A mixed portfolio of transportation research should be the rule. For example, science research on pollutant toxicity and potency is needed. So is engineering research on methods for traffic operations improvements. So is social science research evaluating the performance of programs and planning approaches and designing and analyzing policy alternatives. Increasingly, the questions that need to be addressed are multidisciplinary. Some of the work needed can be short-term, e.g., best practices for citizen participation. Other issues require longer term and higher risk research (e.g., might develop and test new materials for bridge decks).

For the some of the research I have suggested here, the Surface Transportation Environmental Cooperative Advisory Board has recommended the establishment of a new research program. Environmental research has been under-funded for years and there is much catching up to do. Environmental quality is a high priority for our citizens, and public health, ecosystem health, and a sound economy are all tied up in how well we address environment and planning issues. The Advisory Board has recommended a new program overseen by a board representing a broad of core partners (government agencies, industry, environmental organizations, public interest groups, academia) that would work to carry out high priority research with broad stakeholder involvement, in accordance with a strategic agenda, the first version of which is presented in the Board's report. The new program would receive seed funding from USDOT and would be authorized to seek matches from other government and private organizations to fund a peer reviewed, competitive research program. I believe funding in the range of \$15–\$25 million would allow the program to get going, but eventually a research program budgeted at perhaps 6–10 times that level (drawing upon multiple agencies and organizations for funding) would be desirable if the program is to achieve its goals of uncovering fundamental relationships and devising new approaches to transportation and the environment.

University programs also are a valuable resource for the conduct of research. University research orientation and capacity varies considerably, and some transportation programs are focused primarily on undergraduate education and technical assistance projects while others educate both undergrads and grad students and carry out both basic and applied research. Funding for transportation centers has been invaluable at building both kinds of programs and attracting high quality students and faculty into transportation. Many university transportation centers have good relations with their state DOTs, MPOs, transit operators, local transportation agencies, and the private sector, and at least some of their work is carried out in co-operation with them. But some independent research is also critical. For example, federal funding has also allowed faculty members to do evaluation research on organizational design, policy design, and business practices. Independent evaluation of such topics can help elected officials improve public policy and help public agencies improve performance. Independent research is also the source of many innovations and inventions. A sound research program needs to allow researchers to develop new ideas on their own at least some of the time.

The UTC program has done just that—allowed for both partnership projects and independent research—but its low level of funding is problematic. An increase to a baseline of perhaps \$3 million a center would be more realistic, especially for the centers that are large, multi-campus, multidisciplinary efforts. I also believe that

competition for centers and among centers is a good thing, producing the best results.

To sum up, we need more research on changing demographic, economic, and environmental conditions and their implications for transportation, more policy research, more evaluation research, and better data to support these efforts. New competitive research initiatives such as the proposed Surface Transportation Environmental Cooperative Research Program would complement a rejuvenated and better funded program of university research and would pay off in better transportation outcomes.